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2004 Environmental Restoration Contractor Revegetation Monitoring Report

Prepared for the U.S. Department of Energy, Richland Operations Office
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2004 Environmental Restoration Contractor Revegetation Monitoring Report

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EXECUTIVE SUMMARY

This report documents the progress of revegetation monitoring conducted in April through August 2004. This is the fifth year of monitoring following revegetation at the 116-B-1, 116-B-11, and 116-C-5 revegetation sites. Third-year data collections were gathered on the revegetated liquid sites in the 100-D/DR Area and the 600-23 and J.A. Jones sites in the 600 Area of the Hanford Site. Second-year data collections were gathered from the 120-N revegetation area and the Environmental Restoration Disposal Facility (ERDF) mitigation plantings on the Arid Lands Ecology (ALE) Reserve. First-year surveys were conducted on the 300-FF-1 revegetated areas that were seeded in February 2004. Monitoring of these sites is conducted annually to ensure the objectives of the revegetation efforts are accomplished, to note planting techniques that yield the greatest success, and to document successional recovery. It is important to remember that it typically takes 3 to 5 years for revegetation efforts in arid regions to show signs of success.

The 600-23 and J.A. Jones sites were backfilled in late summer 2001 and revegetated in December 2001. Both areas were hydroseeded with a mixture of native seed collected from around the Hanford Site. Triple 16 fertilizer was co-applied during seeding at a rate of 112 kg/ha and irrigated with 0.62 cm/ha of water. The entire seeded area was mulched with grass straw and then crimped into the soil surface with a disk. The 600-23 site was planted with 140 4-in^3 sagebrush (*Artemesia tridentata*) tubelings and 150 4-in^3 bitterbrush (*Purshia tridentata*) tubelings. The J.A. Jones site was planted with 100 4-in^3 sagebrush tubelings and 130 10-in^3 bitterbrush tubelings. Vegetation surveys conducted in 2004 found 39 species on the 600-23 site and 32 species on the J.A. Jones site. Shrub survival data collected from the 600-23 site in May 2004 found survival rates reduced from 2003 collections, calculated at 34.5% for sagebrush and 43.6% for bitterbrush. Shrub survival data were collected in April 2004 from the J.A. Jones site with a resulting survival rate of 87.2% for sagebrush and 21.1% for bitterbrush.

The 300-FF-1 process ponds and burial grounds were seeded in February 2004. This portion of the 300 Area has been designated as future industrial land use, and as such the area was broadcast seeded with only grass species. To facilitate successful germination, TerraBond was

co-applied during seeding at a rate of 16.8 kg/ha. The seeded area was irrigated with 0.62 cm/ha, mulched with grass straw, and crimped with a disk. Vegetation surveys were conducted in early June 2004. Initial data collections indicate successful germination of seeded species, with thickspike wheatgrass (*Agropyron dasytachyum*) having the greatest canopy cover followed by crested wheatgrass (*Agropyron cristatum*). In addition to the seeded species, several native species including false yarrow (*Chaenactis douglasii*), primrose (*Oenothera pallida*), and rabbitbrush (*Chrysothamnus*) seedlings were observed on the sites.

The 116-B-1, 116-B-11, and 116-C-5 sites were seeded in December 1999. Three different fertilizer formulas were applied to backfill areas. The native seed mix and fertilizer treatments were applied with a hydroseeder. The entire seeded area was mulched with straw and irrigated with 0.62 cm/ha of water. In December 2000, 2,600 sagebrush tubelings were planted across the area. Vegetation analysis conducted in May 2004 found 28 species across the sites, including 20 that were native. Sandberg's bluegrass (*Poa sandbergii*) continues to have the greatest canopy cover across all the treatments. Species diversity is highest on the 116-C-5 site, which received a combination of triple 16 and micronutrient fertilizers. Snow buckwheat (*Eriogonum niveum*), yarrow (*Achillea millefolium*), and rabbitbrush seedlings were observed across all sites that received fertilizer.

The 100-D/DR and 100-H liquid waste sites were revegetated in November and December 2001. The entire backfilled area at 100-D/DR (27.9 ha) and at 100-H (22.2 ha) was broadcast seeded with a hydroseeder and irrigated with 0.62 cm/ha of water. The entire seeded area was mulched with grass straw and crimped into the soil surface with a disk. Vegetation analysis at the 100-D/DR Area identified 44 species across the site, 35 of which were native. Sagebrush survival at the 100-D/DR Area is down from 87.8% in 2003 to 78.2% this year.

Vegetation data were not collected at the 100-H Area this year because of the presence of radiologically contaminated mud dauber nests. Water used for contamination control at the 100-H fuel storage basin cleanout project during the summer of 2003 attracted mud dauber wasps that collected contaminated mud from the basin sediments and built nests in various

locations surrounding the 100-H reactor, including the revegetated areas. Data collections will resume upon cleanup of the isolated wasp nests.

The 120-N sites were backfilled in December 2002 and then broadcast seeded with a mix including Sandberg's bluegrass, needle-and-thread grass (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), and thickspike and bluebunch wheat (*Agropyron spicatum*) grasses in mid-January 2003. The 1.6-ha area was separated into four treatment areas. A combination of two separate fertilizer treatments and two types of mulch were used. The entire area was broadcast seeded and irrigated with 0.62 cm/ha of water. One-half of the site was fertilized with triple 16 fertilizer and the other half was fertilized with Biosol, an organic slow-release fertilizer. One-half of the triple 16 treated area and one-half of the Biosol treated area was mulched with grass straw and then crimped into the soil surface. The remaining area was mulched with industry standard hydromulch fiber. Vegetation surveys conducted in April 2004 found 29 species across the area and many false yarrow, wall flower (*Erysimum asperum*), and yarrow seedlings on the hydromulched areas.

In December 2002 the U.S. Department of Energy, Richland Operations Office and the U.S. Fish and Wildlife Service cooperatively worked on a compensatory mitigation planting project on the ALE Reserve for the original construction of the ERDF Cells 1 and 2, where approximately 68.8 ha of mature sagebrush habitat was lost. The mitigation project included three separate planting elements to be conducted in the winter of 2002 and 2003. In the winter of 2002, native grass seed planting and shrub seedling planting was completed. Approximately 64.7 ha were broadcast seeded with 44.8 kg/ha native grass seed in mid-December and then harrowed with a tractor-drawn implement. Approximately 139,000 shrub seedlings were planted across 125.5 ha in three separate areas in early December 2002. The shrubs planted included 10,300 10-in^3, 28,100 4-in^3, and 93,000 bareroot sagebrush; 6,000 gray rabbitbrush; and 6,000 green rabbitbrush (*Chrysothamnus viscidiflorus*). In December 2003, bitterbrush, additional rabbitbrush, and grass plugs were planted in two separate areas on the ALE Reserve. Second-year sagebrush survival data were collected in mid-August with results recorded per seedling type: 36.8% bareroot, 24.6% 10 in^3, and 51.7% 4 in^3. First-year survival data were collected for bitterbrush (52.7%), rabbitbrush (77.1%), and grass plug (53.7%) in mid-August.

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METRIC CONVERSION CHART

Into Metric Units		
If You Know	*Multiply By*	*To Get*
Length		
inches	25.4	millimeters
inches	2.54	centimeters
feet	0.305	meters
yards	0.914	meters
miles	1.609	kilometers
Area		
sq. inches	6.452	sq. centimeters
sq. feet	0.093	sq. meters
sq. yards	0.836	sq. meters
sq. miles	2.6	sq. kilometers
acres	0.405	hectares
Mass (weight)		
ounces	28.35	grams
pounds	0.454	kilograms
ton	0.907	metric ton
Volume		
teaspoons	5	milliliters
tablespoons	15	milliliters
fluid ounces	30	milliliters
cups	0.24	liters
pints	0.47	liters
quarts	0.95	liters
gallons	3.8	liters
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius
Radioactivity		
picocuries	37	millibecquerel

Out of Metric Units		
If You Know	*Multiply By*	*To Get*
Length		
millimeters	0.039	inches
centimeters	0.394	inches
meters	3.281	feet
meters	1.094	yards
kilometers	0.621	miles
Area		
sq. centimeters	0.155	sq. inches
sq. meters	10.76	sq. feet
sq. meters	1.196	sq. yards
sq. kilometers	0.4	sq. miles
hectares	2.47	acres
Mass (weight)		
grams	0.035	ounces
kilograms	2.205	pounds
metric ton	1.102	ton
Volume		
milliliters	0.033	fluid ounces
liters	2.1	pints
liters	1.057	quarts
liters	0.264	gallons
cubic meters	35.315	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity		
millibecquerels	0.027	picocuries

1.0 INTRODUCTION

This report contains a compilation of the results of vegetation monitoring data that were collected in the spring and summer of 2004 from the Environmental Restoration Contractor's (ERC's) revegetation and mitigation areas on the Hanford Site. The monitoring sites included in this report are the 300-FF-1 revegetation area; the 116-B-1, 116-B-11, and 116-C-5 sites; the revegetated area at 100-D/DR; the J.A. Jones and 600-23 sites; 120-N sites; and Environmental Restoration Disposal Facility (ERDF) Cells 1 and 2 mitigation planting on the Arid Lands Ecology (ALE) Reserve. The locations of these sites are shown in Figure 1.

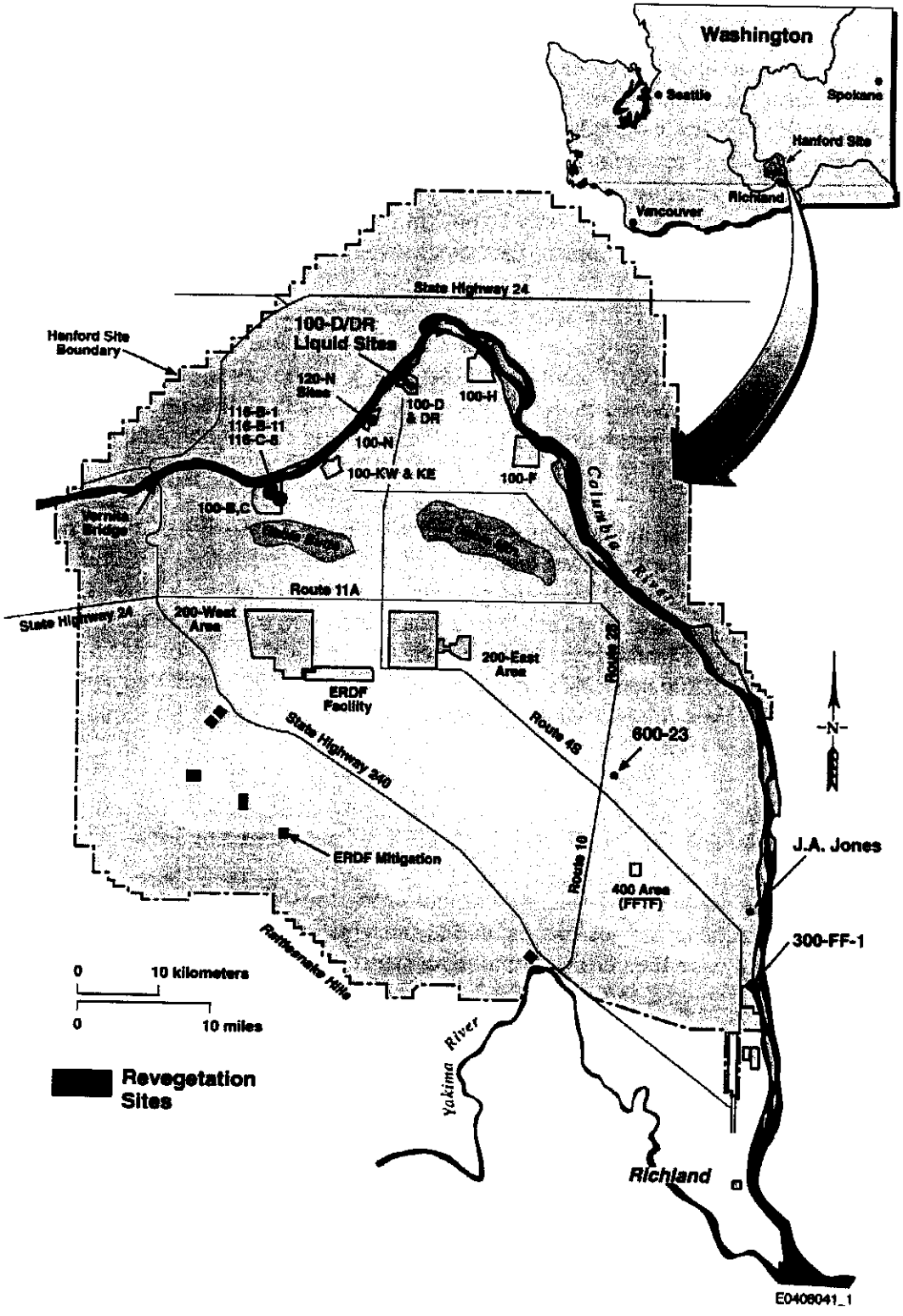
The extent of each revegetation effort varied depending on the surrounding habitat, existing conditions, and future land use designation of the area. The purpose of monitoring revegetation efforts is to measure the progress of plant succession and, in some cases, to evaluate the success of different planting techniques. Each area is discussed separately with a brief description of the revegetation activities and the results from the 2004 monitoring efforts and data collection activities.

This report provides fifth-year monitoring results for the 116-B-1, 116-B-11, and 116-C-5 restoration areas. Third-year monitoring data are provided from the 100-D/DR liquid waste sites and the 600-23 and J.A. Jones sites; second-year data are included for the 120-N sites and ERDF Cells 1 and 2 mitigation planting; and first-year data are included from the 300-FF-1 process ponds and burial grounds. Results from previous years' monitoring are provided in reports for each respective year (i.e., Johnson 2003, Johnson 2002, Johnson 2001, and Johnson et al. 2000). The measurement data from the previous revegetation monitoring reports are summarized in Appendices A, B, C, and D of this report.

1.1 METHODS USED TO EVALUATE VEGETATION RECOVERY

Vegetation monitoring during 2004 consisted of measuring the canopy cover of all plant species found on a site, the frequency of occurrence, and the survival of transplanted sagebrush and bitterbrush. All values were then converted to percentages. Canopy cover and frequency measurements were obtained using the methods described in *Steppe Vegetation of Washington* (Daubenmire 1970). Canopy coverage is defined in Daubenmire (1970) as "the percentage of ground surface included in the vertical projection of a polygon drawn around the extremities of undisturbed foliage of a plant." This method provides a measure of the amount of ground covered by each species. Because it is possible in dense stands of vegetation for species to overlap one another, total measured vegetative cover can exceed 100%. Within each location, a series of plot frames were analyzed for the canopy cover of each species present. Frequency is represented as the percentage of occurrences that a species is observed in the number of plot frames measured. For example, if a species was represented in 10 out of 25 plot frames, its frequency would be 10/25 x 100 = 40%.

Figure 1. Hanford Site Showing Locations of Revegetation Sites.



The relative magnitude of a frequency rating in comparison to a canopy coverage rating provides an index of species distribution and its influence within a vegetation community. At sites where shrubs were planted, the survival rate was measured by counting a representative number of plants at the site, determining if the plants were dead or alive, and then calculating the percent survival rate.

This report uses taxonomic nomenclature from *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973). Some of the plant taxonomic names have been updated, and the revised names are provided in Appendix E of this report. Plant identification was conducted using the nomenclature in Hitchcock and Cronquist (1973) and also in *Vascular Plants of the Hanford Site* (Sackschewsky and Downs 2001).

The type and extent of each revegetation effort is based on the location of the project and the future land designation of that area. The objective of revegetating the 120-N-1 and 120-N-2 sites was to stabilize the soils and initiate the establishment of native species. The restoration effort included the combined use of two fertilizer and two mulch types. The sites will be evaluated to document plant establishment and success per material type over a 5-year period.

In the long-range planning, portions of the 300 Area have been designated for future industrial use. Therefore, the objective of this revegetation effort is long-term interim stabilization. The *Hanford Site Biological Resources Management Plan* (BRMaP) (DOE-RL 2001) prescribes seeding crested wheatgrass (*Agropyron cristatum*); however, to increase species diversity over the 28.3-ha area, six grass species were planted. The objective of revegetation at most remedial action sites is to restore the land to plant communities that are dominated by native plants that will eventually provide wildlife habitat. Secondary objectives often include using different planting methods and techniques to improve success, while incorporating experience and knowledge gained from previous plantings. The secondary objective of revegetation efforts on the 116-B-1, 116-B-11, and 116-C-5 sites was to evaluate the effectiveness of different fertilizer treatments on the success of native species establishment.

Success criteria differ for each site based on the varying soil types and microclimatic conditions. For example, sandy areas promote different species with differing recovery rates and plant densities than those found in rocky soils; therefore, the criteria for judging success will be different. All sites will be evaluated based on the plant canopy cover, plant community composition, and survival and growth rates of the planted shrubs. These criteria are detailed in the *Revegetation Manual for the Environmental Restoration Contractor* (McLendon et al. 1997). A revegetation effort will be considered to be successful if the area is stabilized to prevent erosion and is dominated by recovering stands of native sagebrush, forbs, and grasses. Areas identified for future industrial use will be stabilized but may not likely be planted with native species; the wheatgrass (*Agropyron*) species will likely be planted in these areas because of the potential for future land disturbance.

2.0 600 AREA REVEGETATION

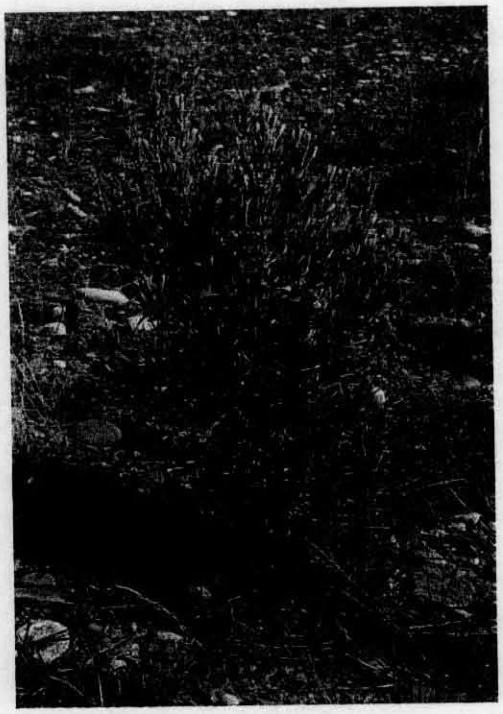
2.1 600-23 AND J.A. JONES SITES

The 600-23 and J.A. Jones sites were remediated as part of the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-F-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (EPA et al. 1999). The 600-23 site is located north of the Hanford Site's Wye Barricade, along Route 2 south, and is within the Pit 11 boundary (Figure 2). The J.A. Jones site is located north of the 300 Area (Figure 3). Both sites were used for the disposal of construction waste and miscellaneous debris. Prior to remediation, the 600-23 site was dominated by cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola kali*), with occurrences of snow buckwheat (*Eriogonum niveum*) and bitterbrush (*Purshia tridentata*). The J.A. Jones site was dominated by cheatgrass and gray rabbitbrush (*Chrysothamnus nauseosus*) with some Sandberg's bluegrass (*Poa sandberii*) and bitterbrush. The area surrounding the J.A. Jones site is mature sagebrush (*Artemesia tridentata*) and is identified as a Level III resource in the BRMaP (DOE-RL 2001). The goal of each revegetation effort was to stabilize the soils and initiate vegetative recovery.

The areas disturbed by remedial action activities include a 0.78-ha area at the 600-23 site and a 0.4-ha area at the J.A. Jones site. Both sites were revegetated under the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) Milestone M-16-41C in mid-December 2001 (Ecology et al. 1998). Both areas were planted within months of being recontoured to the surrounding terrain. Both areas were broadcast seeded with a native seed mix collected from the Hanford Site. The entire revegetated area had 112 kg/ha of triple 16 fertilizer co-applied during seeding and irrigated with 0.62 cm/ha of water. The seeded areas were mulched with straw at a rate of 4.5 metric tons/ha and then crimped into the soil surface with a disk. The 600-23 site was planted with 140 4-in^3 sagebrush tubelings and 150 4-in^3 bitterbrush tubelings. The J.A. Jones site was planted with 100 4-in^3 sagebrush tubelings and 130 10-in^3 bitterbrush tubelings. All bitterbrush plants were protected with biodegradable mesh tubes placed around the plants and anchored with bamboo stakes to prevent browsing by deer.

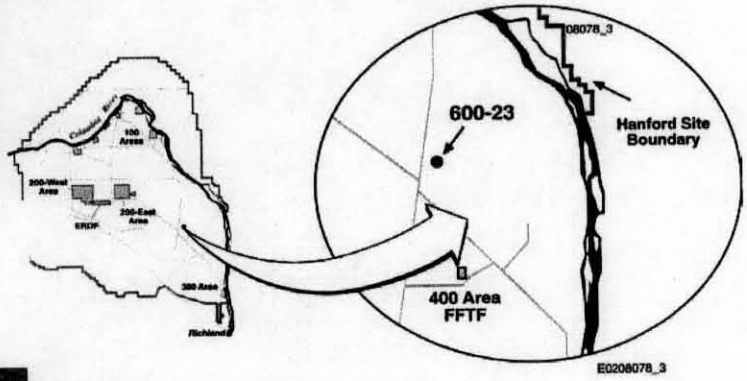
The third-year vegetation survey was conducted on the 600-23 site on June 1, 2004. Thirty-nine species were identified on the site, eight more species than were observed in 2003. Of the species identified, 15 were planted (Table 1). Species that were planted and observed for the first time this year included prairie clover (*Petalostemon ornatum*), globe mallow (*Sphaeralcea munroana*), Indian ricegrass (*Oryzopsis hymenoides*), green rabbitbrush (*Chrysothamnus viscidiflorus*), and wallflower (*Erysimum asperum*). Total cover across the site increased 22.8% from last year's survey, with the greatest increase in Sandberg's bluegrass, which increased 11.6%. Cheatgrass and Russian thistle cover remained consistent around 5.6% and 2%, respectively, when compared to 2003 data. Shrub survival of both sagebrush and bitterbrush dropped from last year's calculated survival rate to 34.5% and 43.6% (Table 2); however, several sagebrush plants were forming flower buds, and a few bitterbrush plants produced seed for the first time this year (Figure 2).

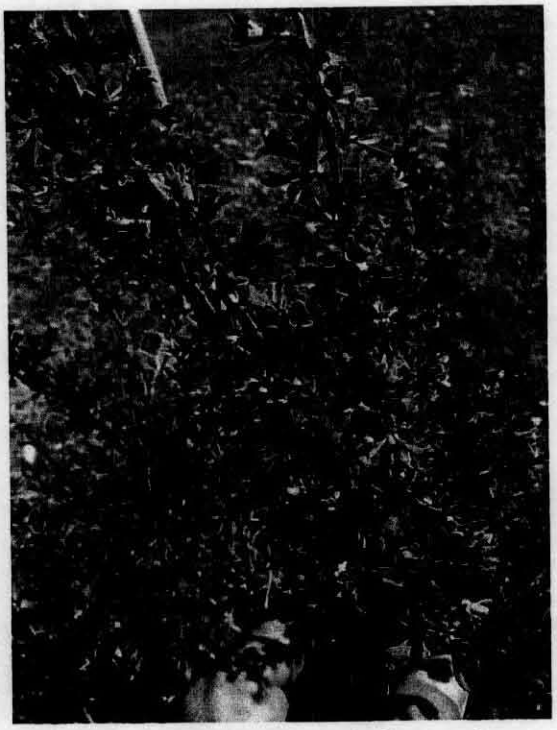
Figure 2. 600-23 Site.



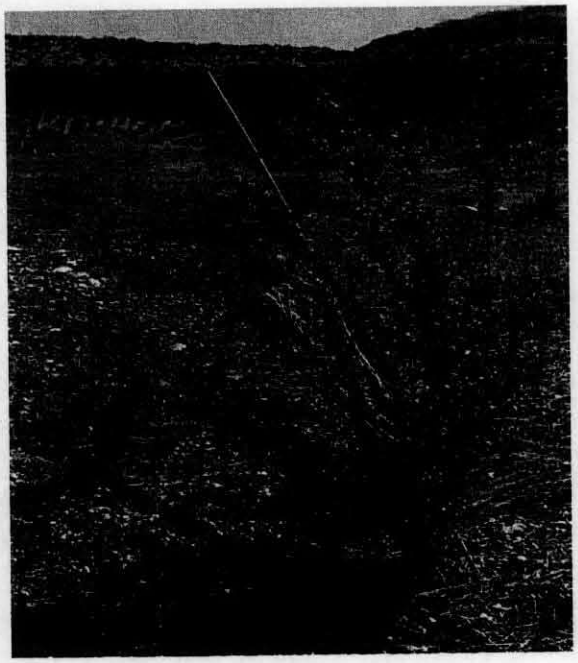
2001 planted sagebrush, June 2004.

Yarrow, Cusick's sunflower, and thickspike wheatgrass, June 2004.



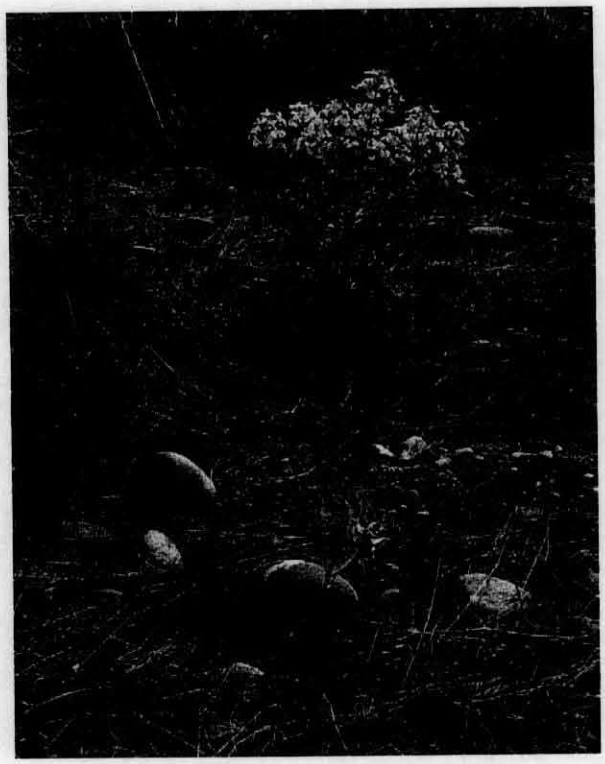


2001 planted bitterbrush producing seed, June 2004.



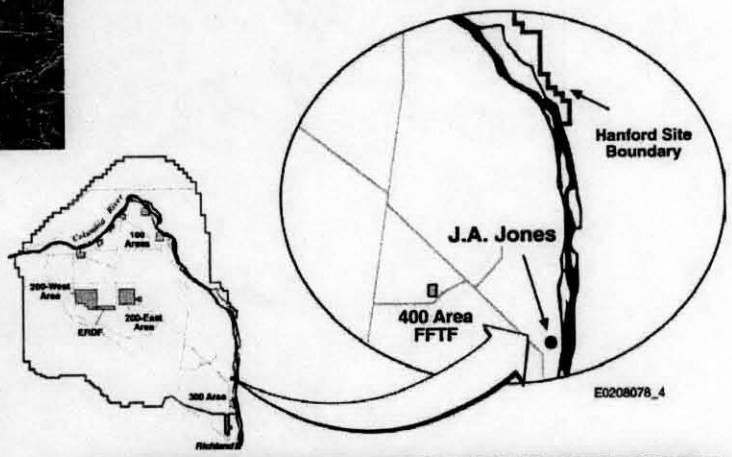
3-year-old bitterbrush planted on the 600-23 site.

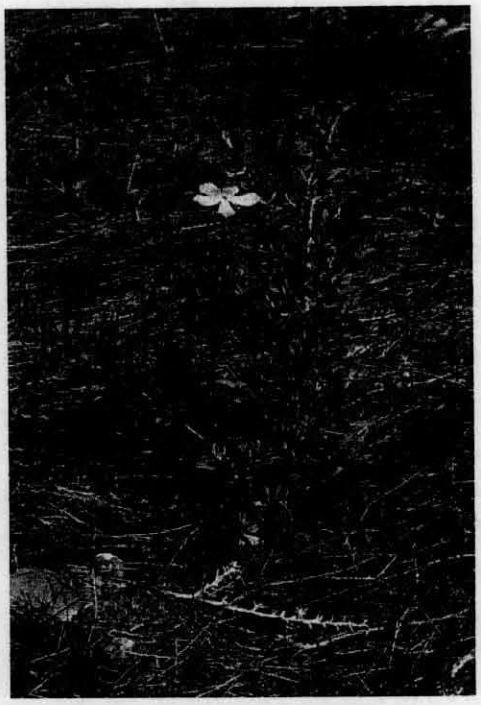
Figure 3. J.A. Jones Site.



Sandbeard tongue, wallflower, and yarrow, June 2004.

2001 planted sagebrush, April 2004.





Bitterbrush and phlox, June 2004.

Woolly-pod milkvetch in seed mix June, 2004.

Table 1. Percent Canopy Cover and Frequency of Occurrence on the 600-23 Site in 2004.

Species	% Cover	% Frequency
Vulpia myuros[a] (rattail fescue)	5.7	56
Poa sandbergii (Sandberg's bluegrass)	14.2	100
Bromus tectorum[a] (cheatgrass)	5.6	68
Salsola kali[a] (Russian thistle)	2.3	72
Achillea millefolium (yarrow)	0.8	12
Melilotus alba (sweetclover)	0.3	12
Eriogonum niveum (snow buckwheat)	0.1	4
Stipa comata (needle-and-thread grass)	X	X
Agropyron sp. (wheatgrass)	10.3	88
Artemisia tridentata (big sagebrush)	X	X
Festuca octoflora (slender sixweeks)	0.1	4
Sisymbrium altissimum[a] (tumble mustard)	0.1	4
Holosteum umbellatum[a] (jagged chickweed)	0.1	4
Lactuca seriola[a] (prickly lettuce)	0.2	8
Amsinckia lycopsoides (tarweed fiddleneck)	X	X
Phacelia hastata (whiteleaf scorpionweed)	X	X
Ambrosia acanthicarpa (bur ragweed)	0.1	4
Poa bulbosa[a] (bulbous bluegrass)	0.6	24
Chaenactis douglasii (hoary falseyarrow)	X	X
Purshia tridentata (bitterbrush)	X	X
Mentzelia laevicaulis (blazing star)	X	X
Machaeranthera canescens (hoary aster)	0.1	4
Draba verna (spring whitlow)	0.5	20
Epilobium panuculatum (tall willowherb)	1	40
Astragalus sclerocarpus (stalk-pod milkvetch)	X	X
Phacelia linearis (threadleaf scorpionweed)	X	X
Penstemon acuminatus (sand beardtongue)	X	X
Helianthus cusickii (Cusick's sunflower)	X	X
Erodium cicutarium[a] (storksbill)	0.1	4
Chrysothamnus nauseosus (gray rabbitbrush)	0.2	8
Oenothera pallida (evening primrose)	0.1	4
Tragopogon dubius[a] (yellow salsify)	0.1	4
Astragalus caricinus (buckwheat milkvetch)	X	X
Medicago sativa[a] (alfalfa)	X	X
Oryzopsis hymenoides (Indian ricegrass)	X	X
Sphaeralcea munroana (globemallow)	X	X
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X
Erysimum asperum (wallflower)	X	X
Erigeron poliospermus (cushion fleabane)	X	X
Petalostemon ornatum (prairie clover)	X	X
Bare soil	35.9	100
Litter	38.7	100
Total cover (does not include bare soil or litter)	**42.6**	

[a] Introduced species.
X = Present but not counted in plot frames

Table 2. Percent Survival Rate of Transplanted Shrubs.

Site	2002	2003	2004
600-23			
Sagebrush	83.6	83.6	34.5
4-in^3 bitterbrush	78.2	78.2	43.6
J.A. Jones			
Sagebrush	89.2	81.1	87.2
10-in^3 bitterbrush	39	19.5	21.1
100-D/DR			
Sagebrush	93.8	87.8	78.2
100-H			
Sagebrush	59.8	59	--

Third-year vegetation analysis was conducted in April 2004 on the J.A. Jones site. The survey identified 32 species across the site, including 14 species that were included in the seed mix. Sandberg's bluegrass cover remains consistent at 17%, while cheatgrass cover fell 8.9% from 2003 data collections (Table 3). Survival of both planted sagebrush and bitterbrush seedlings increased slightly this year as some plants were previously identified as dead, yielding a sagebrush survival of 87.2% and bitterbrush survival at 21.1%. Comparison of the third-year shrub survival of the 10-in^3 bitterbrush tubelings planted at the J.A. Jones site against the 4-in^3 bitterbrush tubelings planted at the 600-23 site found greater survival, 43.6% of the 4-in^3 plants over the larger 10-in^3 plants with 21.1%. While greater survival was expected from the larger plants, reduced survival could be contributed to the rapid establishment and subsequent competition from the other species on the J.A. Jones site, as well as differences in soil types.

3.0 300 AREA

3.1 300-FF-1 PROCESS PONDS AND BURIAL GROUNDS

The process pond system received cooling water and low-level liquid process wastes from the fuel fabrication facilities and early laboratories. The two solid waste burial grounds, 618-4 and 618-5, received dry waste from the 300 Area operations. Remediation on the 300-FF-1 Operable Unit was initiated in 1997 and completed in 2004 with the completion of backfill and revegetation in February 2004.

In long-range planning, this portion of the 300 Area has been designated as future industrial land use (EPA et al. 1996). Guidance provided in the BRMaP (DOE-RL 2001) prescribe industrial areas to be stabilized with crested wheatgrass. Therefore, in mid-February, approximately 28.3 ha of recently backfilled and recontoured area was broadcast seeded with 11.2 kg/ha

Sandberg's bluegrass, 11.2 kg/ha crested wheatgrass, 5.6 kg/ha Regreen® (*Agropyron* hybrid), 5.6 kg/ha Indian ricegrass, 5.6 kg/ha thickspike wheatgrass, 5.6 kg/ha bluebunch wheatgrass, and 2.45 kg/ha needle-and-thread grass. To help promote successful germination, 16.8 kg/ha of TerraBond was co-applied during seeding to help prevent soil erosion and prevent soil from drying until seedling emergence, as some of the area is very sandy. Straw mulch was distributed across the site and crimped with a serrated disk (Figure 4).

First-year data were collected in early June 2004. All seven of the planted species were observed on the sites; thickspike wheatgrass had the greatest percent cover with 19%, (Table 4) followed by crested wheatgrass with 6.6% and 80% frequency and bluebunch wheatgrass with 2.9% cover and 60% frequency of occurrence (Table 4). In addition to the planted species, several native species were observed on the sites, including false yarrow (*Chaenactis douglasii*), scorpionweed (*Phacelia hastata*), primrose (*Oenothera pallida*), dune scurfpea (*Psoralea lanceolata*), and rabbitbrush. The presence of these species is likely a result of stockpiled soils that were redistributed across portions of the remediated sites. While initial data collections indicate successful germination and seedling emergence, data collections after an entire growing season will yield more accurate results.

Table 3. Percent Canopy Cover and Frequency of Occurrence on the J.A. Jones Site in 2004. (2 Pages)

Species	% Cover	% Frequency
Argropyron dasytachum (thickspike wheatgrass)	5.7	36
Bromus tectorum[a] (cheatgrass)	4	80
Salsola kali[a] (Russian thistle)	2.1	64
Poa sandbergii (Sandberg's bluegrass)	16.7	96
Stipa comata (needle-and-thread grass)	X	X
Gilia leptomeria (Great Basin gilia)	X	X
Achillea millefolium (yarrow)	0.7	28
Amsinckia lycopsoides (tarweed fiddleneck)	1.2	48
Artemisia tridentata (big sagebrush)	0.1	4
Purshia tridentata (bitterbrush)	X	X
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	4
Epilobium paniculatum (tall willowherb)	0.1	4
Eriogonum niveum (snow buckwheat)	X	X
Erodium cicutarium[a] (storksbill)	0.1	4
Lactuca serriola[a] (prickly lettuce)	X	X
Festuca octoflora (slender sixweeks)	0.1	4
Sisymbrium altissimum[a] (tumblemustard)	X	X
Machaeranthera canescens (hoary aster)	0.1	4
Chaenactis douglasii (hoary falseyarrow)	X	X

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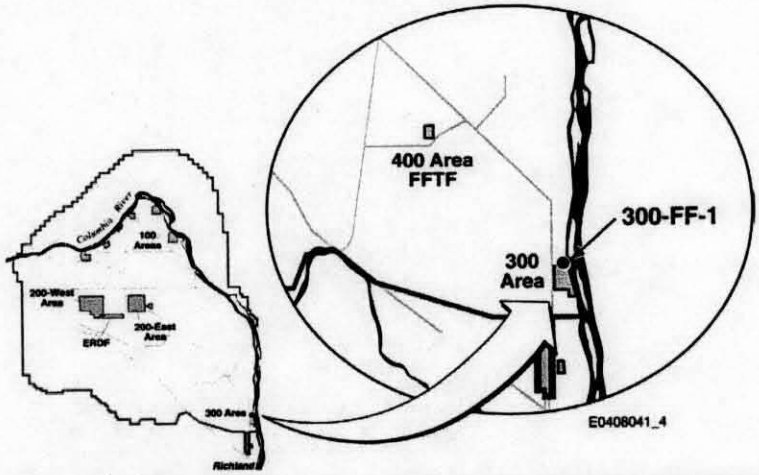
Table 3. Percent Canopy Cover and Frequency of Occurrence on the J.A. Jones Site in 2004. (2 Pages)

Astragalus succumbens (crouching milkvetch)	0.1	4
Microsteris gracilis (pink microsteris)	0.1	4
Penstemon acuminatus (sand beardtongue)	X	X
Balsamorhiza careyana (Carey's balsamroot)	X	X
Phlox longifolia (longleaf phlox)	0.1	4
Ambrosia acanthicarpa (bur ragweed)	0.6	24
Erigeron poliospermus (cushion fleabane)	X	X
Draba verna (spring whitlowgrass)	0.2	8
Holosteum umbellatum[a] (jagged chickweed)	1.7	68
Erysimum occidentale (wallflower)	0.1	4
Erigeron filifolius (threadleaf fleabane)	X	X
Astragalus sclerocarpus (stalked-pod milkvetch)	X	X
Centaurea diffusa[a] (diffuse knapweed)	X	X
Biotic crust	1	40
Bare soil	29.8	92
Litter	27.7	100
Total cover (does not include biotic crust or litter)	**34.9**	

[a] Introduced species.
X = Present but not counted in plot frames

Figure 4. 300-FF-1 Sites.



Seeding north process pond, February 2004.

Aerial of 300-FF-1 revegetation, April 2004.

Grass seedlings, June 2004.

Table 4. Percent Canopy Cover and Frequency of Occurrence at the 300-FF-1 Process Ponds and Burial Grounds.

Species	% Cover	% Frequency
Agropyron dasytacum (thickspike wheatgrass)	19	91.4
Agropryon spicatum (bluebunch wheatgrass)	2.9	60
Agropyron hybrid (Regreen)	1.9	62.9
Agropyron cristatum[a] (crested wheatgrass)	6.6	80
Stipa comata (needle-and-thread grass)	0.9	37.1
Oryzopsis hymenoides (Indian ricegrass)	1.3	51.4
Vulpia myuros[a] (rattail)	0.6	25.7
Melilotus alba[a] (sweetclover)	X	X
Eriogonum niveum (snow buckwheat)	X	X
Poa sandbergii (Sandberg's bluegrass)	1.4	57.1
Chaenactis douglasii (hoary falseyarrow)	X	X
Centaurea diffusa[a] (diffuse knapweed)	X	X
Sisymbrium altissimum[a] (tumble mustard)	1.0	40
Bromus tectorum[a] (cheatgrass)	2.6	62.9
Lactuca seriola[a] (prickly lettuce)	X	X
Amsinckia lycopsoides (tarweed fiddleneck)	0.3	11.4
Phacelia hastata (whiteleaf scorpionweed)	0.1	2.9
Ambrosia acanthicarpa (bur ragweed)	0.1	2.9
Erodium cicutarium[a] (storksbill)	0.1	5.7
Senecio vulgaris[a] (common groundsel)	0.4	14.3
Amaranthus alba[a] (pigweed)	0.1	2.9
Kochia scoparia[a] (Kochia)	X	X
Salsola kali[a] (Russian thistle)	1.1	28.6
Lepidium perfoliatum (clasping pepperweed)	X	X
Hordeum leporinum[a] (hare barley)	0.1	2.9
Oenothera pallida (primrose)	X	X
Psoralea lanceolata (dune scurfpea)	X	X
Cryptantha circumscissa (matted cryptantha)	X	X
Plantago patagonica (Indian wheat)	X	X
Cardaria draba[a] (whitetop)	X	X
Polypogon monspeliensis[a] (rabbitfoot grass)	0.3	11.4
Poa annua[a] (annual bluegrass)	0.1	2.9
Chrysothamnus nauseosus (gray rabbitbrush)	X	X
Bare Soil	25.9	100
Litter	52.7	100
Total cover (does not include biotic crust or litter)	**41**	

[a] Introduced species.
X = Present but not counted in plot frames

4.0 100-B/C AREA REVEGETATION

4.1 116-B-1, 116-B-11, AND 116-C-5 REVEGETATION SITES

The 116-B-1, 116-B-11, and 116-C-5 sites were remediated as part of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial action project for the 100-B/C Area (EPA et al. 1995). Initial revegetation efforts on these sites were completed December 6 through 9, 1999. The objective of revegetating these sites was to stabilize the soils while establishing a plant community dominated by native species, with a limited number of introduced species within the community after establishment.

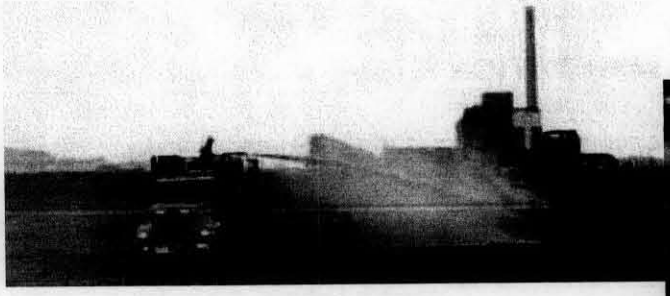
The material used to backfill the remediated waste sites was excavated from the nearby Pit 24. The backfill material is representative of naturally occurring soils in the area and consists of rocky sand and gravel. The material was placed as the top horizon of the remediated sites, and consequently the planting medium was excavated from subsoil horizons within the pit, which was very nutrient deficient. To compensate, three fertilizer treatments were applied on the backfilled sites to evaluate the results of the fertilizer applications and the establishment of the seeded native species.

On the southern half of the 116-B-11 site, a micronutrient fertilizer mixture containing sulfur (22.36%), soluble pot ash (1.6%), nitrogen (1.24%), magnesium (0.08%), zinc (0.24%), and boron (0.04%) was applied at a rate of 112 kg/ha. The northern half of 116-B-11 received triple 16 (16% each of nitrogen, phosphorous, and potassium) fertilizer applied at a rate of 112 kg/ha. The 116-C-5 site received a combination of triple 16 and micronutrient fertilizers applied to the entire site at a rate of 112 kg/ha each. As a control site, no fertilizer was applied to the 116-B-1 site (Figure 5).

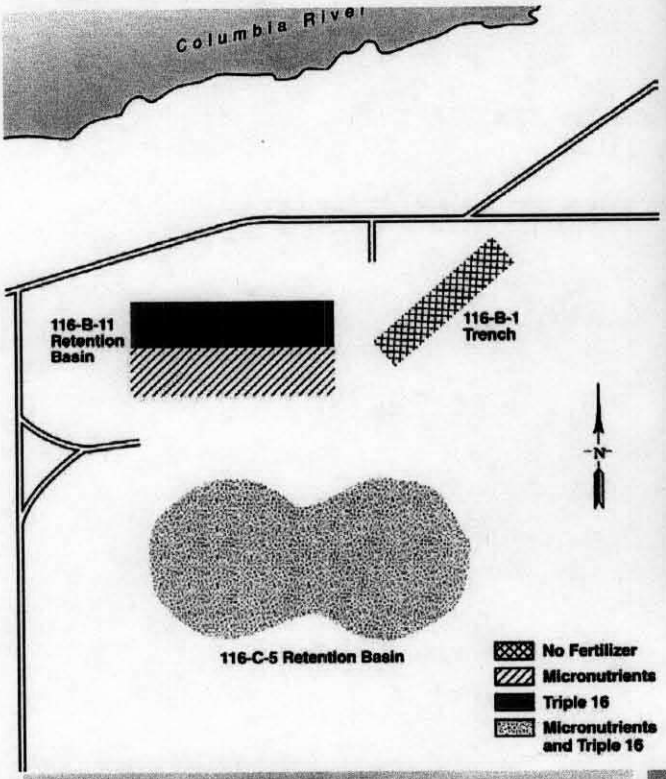
A native seed mix was broadcast with a hydroseeder across all sites. The seed mix and seeding rates included Sandberg's bluegrass (22.4 kg/ha), needle-and-thread grass (2.24 kg/ha), sagebrush (1.12 kg/ha), snow buckwheat (1.12 kg/ha), Carey's balsamroot (*Balsamorhiza careyana*) (1.12 kg/ha), and yarrow (0.28 kg/ha). Small amounts of cushion fleabane (*Erigeron poliospermus*) and Piper's daisy (*Erigeron piperianus*) were also mixed in the hydroseeder and applied to the 116-C-5 site, but due to the small size and amount of seed, the quantities were not measured. Following the seeding, grass straw was applied as mulch across all the seeded sites at a rate of 4.5 metric tons per hectare.

The entire seeded area was irrigated with 0.62 cm/ha of water. Half the water was applied through the hydroseeder during the application of seed and fertilizer mix. The remaining irrigation was applied after the distribution of the straw mulch.

Figure 5. 116-C-5 Site.

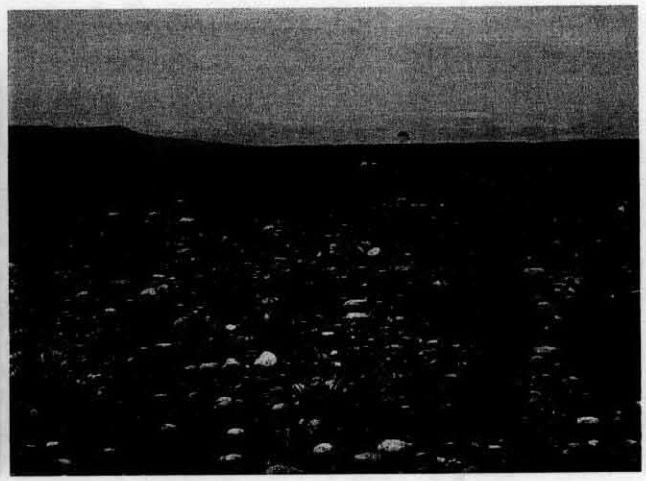


Seeding 116-C-5, December 1999.



Sagebrush and Sandberg's bluegrass seedlings, April 2000.

116-C-5, April 2000 four months after seeding.



116-C-5, May 2004.

In December 2000, 2,600 sagebrush tubelings were planted across the sites. Due to the rocky plant bed, holes were mechanically augured into the ground and then filled with moist sand with each tubeling planted in the center of the sand.

Fifth-year vegetation surveys were conducted in late May 2004. Twenty-eight species were observed across the sites, 19 of which were native, which is constant with 2003, 2002, and 2001 data collections (Table 5). Total canopy cover decreased across all four treatment areas this year, with the greatest decrease of 21.2% cover occurring on the triple 16 fertilizer area, yielding a total cover of 25.1%. While the frequency of Russian thistle is up to 60%, its highest cover is on the 116-B-1 site at only 1.5% (Table 6). Total cover of nonnative species ranged from 4.8% on the 116-C-5 site to 3.9% on the micronutrient-only fertilizer treatment area. The objective of this restoration effort to stabilize the soils while establishing native plant community with limited number of nonnative species has been achieved, as demonstrated by the limited influence of introduced species across all treatment areas. The original seeded species are now providing the area with seed source for further establishment as especially seen with cushion fleabane and Piper's daisy as only a small amount of seed was planted and there has been an increased frequency of observation of the daisies over the last three years. Species diversity remains highest on the 116-C-5 site, which received a combination of triple 16 and micronutrients, with 29 species identified, of which 20 were native, followed by 23 and 22 species on the triple 16 and micronutrient fertilizer treatments on the 116-B-11 site. Snow buckwheat, yarrow, and gray rabbitbrush seedlings were observed on the sites that received fertilizer. The planted sagebrush tubelings throughout the site demonstrated mixed growth and vigor. Some plants were actively growing and forming flower buds (Figure 6).

Table 5. Percent Canopy Cover on 100-B/C Revegetation Sites in 2004. (2 Pages)

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro-nutrient)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	17.4	12.5	12	4.8
Eriogonum niveum (snow buckwheat)	3.7	3.9	4.7	3.0
Salsola kali[a] (Russian thistle)	0.7	1	1.2	1.5
Achillea millefolium (yarrow)	1.1	0.7	0.4	0.2
Sisymbrium altissimum[a] (tumblemustard)	X	0.1	0.1	0.3
Descurainia pinnata (western tansymustard)	0.1	0.1	0.2	--
Centaurea diffusa[a] (diffuse knapweed)	X	X	X	X
Artemisia tridentata (big sagebrush)	0.1	0.1	0.2	X
Chrysothamnus nauseosus (gray rabbitbrush)	0.9	1.4	0.4	1.0
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X	--	X
Balsamorhiza careyana (Carey's balsamroot)	0.1	0.1	0.1	X
Bromus tectorum[a] (cheatgrass)	4.1	3.3	2.1	2.3
Oryzopsis hymenoides (Indian ricegrass)	0.1	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	--	--	--
Machaeranthera canescens (hoary aster)	0.1	0.1	X	--

Table 5. Percent Canopy Cover on 100-B/C Revegetation Sites in 2004. (2 Pages)

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro-nutrient)	116-B-1
Epilobium paniculatum (tall willowherb)	0.5	0.3	0.8	0.3
Microsteris gracilis (annual plox)	X	--	--	--
Medicago sativa[a] (alfalfa)	X	0.2	0.2	X
Agropyron dasytachyum (thickspike wheatgrass)	0.4	1	1.5	--
Stipa comata (needle-and-thread grass)	0.1	0.2	X	X
Tragopogon dubius[a] (yellow salsify)	X	X	0.1	--
Erigeron poliospermus (cushion fleabane)	0.1	0.1	0.1	X
Erigeron piperianus (Piper's daisy)	X	--	--	--
Agropyron cristatum[a] (crested wheatgrass)	X	X	0.2	--
Ambrosia acanthicarpa (bur ragweed)	X	X	X	X
Erodium cicutrium[a] (storksbill)	X	--	--	--
Agropyron spicatum (bluebunch wheatgrass)	3.3	X	0.6	--
Erigeron linearis (desert yellowdaisy)	X	--	--	--
Bare soil	49.7	59	54.9	65.0
Litter	16.9	12.1	15.4	15.3
Total Cover (does not include bare soil or litter)	**32.8**	**25.1**	**24.9**	**13.5**

[a] Introduced species.
X = Present but not counted in plot frames
-- = Not observed on the site

Table 6. Frequency of Occurrence on 100-B/C Revegetation Sites in 2004. (2 Pages)

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro-nutrient)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	100	100	100	100
Eriogonum niveum (snow buckwheat)	88	76	88	87
Salsola kali[a] (Russian thistle)	28	40	48	60
Achillea millefolium (yarrow)	44	8	16	7
Sisymbrium altissimum[a] (tumblemustard)	X	4	4	13
Descurainia pinnata (western tansymustard)	4	4	8	--
Centaurea diffusa[a] (diffuse knapweed)	X	X	X	X
Artemisia tridentata (big sagebrush)	4	4	8	X
Chrysothamnus nauseosus (gray rabbitbrush)	36	56	16	40
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X	--	X
Balsamorhiza careyana (Carey's balsamroot)	4	4	4	X
Bromus tectorum[a] (cheatgrass)	68	52	44	60

Table 6. Frequency of Occurrence on 100-B/C Revegetation Sites in 2004. (2 Pages)

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro-nutrient)	116-B-1
Oryzopsis hymenoides (Indian ricegrass)	4	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	--	--	--
Machaeranthera canescens (hoary aster)	4	4	X	--
Epilobium paniculatum (tall willowherb)	20	12	32	13
Microsteris gracilis (annual plox)	X	--	--	--
Medicago sativa[a] (alfalfa)	X	8	8	X
Agropyron dasytachyum (thickspike wheatgrass)	16	20	20	--
Stipa comata (needle-and-thread grass)	4	8	X	X
Tragopogon dubius[a] (yellow salsify)	X	X	4	--
Erigeron poliospermus (cushion fleabane)	4	4	4	X
Erigeron piperianus (Piper's daisy)	X	--	--	--
Agropyron cristatum[a] (crested wheatgrass)	X	X	8	--
Ambrosia acanthicarpa (bur ragweed)	X	X	X	X
Erodium cicutrium[a] (storksbill)	X	--	--	--
Agropyron spicatum (bluebunch wheatgrass)	20	X	4	--
Erigeron linearis (desert yellowdaisy)	X	--	--	--
Bare soil	100	100	100	100
Litter	100	100	100	100

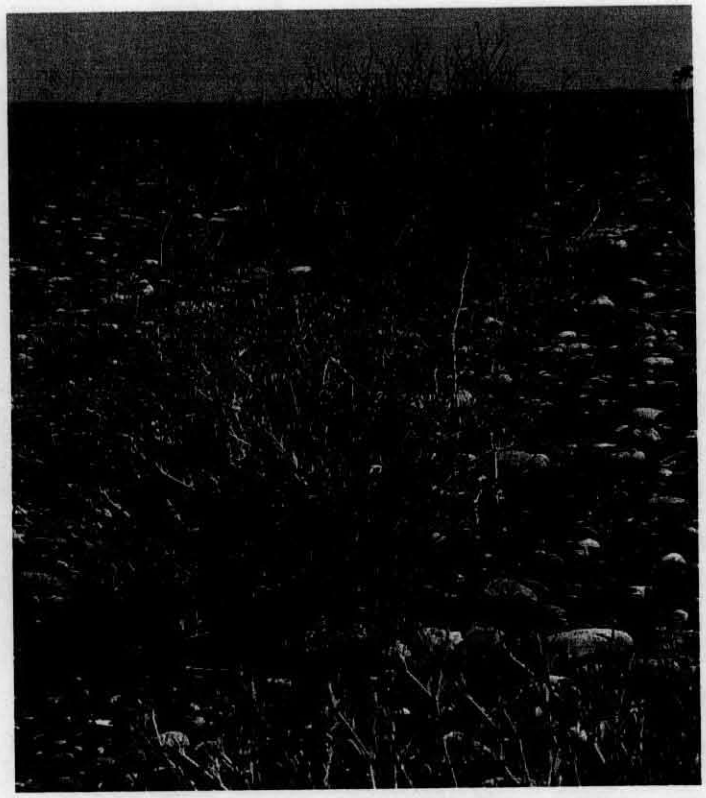
[a] Introduced species.
X = Present but not counted in plot frames
-- = Not observed on the site

Figure 6. 100-B/C Sites.

December 2000 planted sagebrush, May 2004.

Cushion fleabane and Sandberg's bluegrass on 116-C-5 site, included in seed mix in December 1999.

Carey's balsamroot on 116-C-5 site, May 2004



Snow buckwheat on 116-B-11 site seeded in December 1999.

5.0 100-D/DR AND 100-H AREA REVEGETATION

100-D/DR and 100-H liquid waste sites were remediated under the direction of the *Interim Action Record of Decision for the U.S. DOE Hanford 100 Area, 100-BC-1, 100-DR-1, 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA et al. 1995). Remediation and backfill was completed at the 100-D/DR and 100-H Areas in the spring and summer of 2001. The remediated sites were revegetated in November and December 2001 in accordance with the Tri-Party Agreement Milestone M-16-26B. Twenty-four sites over 27.2 ha at the 100-D/DR Area and 12 sites including the borrow area over 21.7 ha at the100-H Area were planted. The primary objective of this revegetation effort was to stabilize the soils while promoting the establishment of a vegetative community dominated by native species. Several species were added to the native seed mix to provide the area with a seed source. The establishment of these species will be observed in the annual vegetation monitoring program with results documented and used to develop seed mixes that will be successful in future revegetation efforts.

The material used as backfill in the 100-D/DR and 100-H Areas was obtained from nearby borrow pits. As with most borrow areas, the material is excavated from several feet below grade and was nutrient deficient. To help establish vegetation on these soils, triple 16 fertilizer was co-applied at a rate of 112 kg/ha during seeding. A native seed mix was broadcast across the sites with a hydroseeder. The seed mix included 22.4 kg/ha of Sandberg's bluegrass; 2.24 kg/ha of needle-and-thread grass; and small amounts of yarrow (*Achillea millefolium*), prairie clover, sagebrush, rabbitbrush, Indian ricegrass, Carey's balsamroot, snow buckwheat, milkvetch (*Astragulas*), mariposa lily (*Calochortus macrocarpus*), grayball sage (*Salvia dorrii*), false yarrow (*Chaenactis douglasii*), slender hawksbeard (*Crepis atrabarba*), sanddrop seed (*Sporobolus cryptandrus*), fleabane (*Erigerion*), globe mallow, squirreltail grass (*Sitanion hystrix*), Cusick's sunflower (*Helianthus cusickii*), wallflower, blazingstar (*Mentzelia laevicaulis*), springparsely (*Cympopterus terebinthinus*), sand beardtongue, and longleaf phlox (*Phlox longifolia*). The entire seeded area was irrigated with 0.62 cm/ha of water. One-half of the irrigation was applied during initial seeding, with the remaining irrigation applied immediately after seeding. Grass straw mulch was distributed across the entire seeded area at a rate of 4.5 metric tons per hectare and crimped with disk. Following the mulch application, 21,700 4-in^3 sagebrush tubelings were planted across the sites.

5.1 100-D/DR AREA

Third-year vegetation surveys were conducted in May 2004. Forty-five species were observed on the site this year, nine more species than observed in 2003, including prairie clover, wall flower, stalked pod milkvetch (*Astragalus sclerocarpus*), Carey's balsamroot, evening primrose (*Oenothera pallida*), low lupine (*Lupinus pusillus*), threadleaf fleabane (*Erigeron filifolius*), Cusick's sunflower, and woolly pod milkvetch (*Astragalus purshii*). Of the 44 species identified, 35 were native (Table 7), including 12 species that were included in the seed mix. This year the revegetated area was dominated by Sandberg's bluegrass, cheatgrass, and

bluebunch wheatgrass with 12 %, 7.8%, and 5.2% covers, respectively. Russian thistle influence within the vegetative community has shown a significant reduction from 13.1% cover and 98% frequency recorded in 2002 to 2.3% cover and 72% frequency in 2004.

Table 7. Percent Canopy Cover and Frequency of Occurrence on the 100-D/DR Liquid Sites in 2004. (2 Pages)

Species	% Cover	% Frequency
Vulpia myuros[a] (rattail fescue)	2.9	56
Poa sandbergii (Sandberg's bluegrass)	12	76
Eriogonum niveum (snow buckwheat)	X	X
Salsola kali[a] (Russian thistle)	2.3	72
Achillea millefolium (yarrow)	0.3	12
Sisymbrium altissimum[a] (tumblemustard)	0.4	16
Descurainia pinnata (western tansymustard)	0.1	4
Amsinckia lycopsoides (tarweed fiddleneck)	0.1	4
Centaurea diffusa[a] (diffuse knapweed)	X	X
Artemisia tridentata (big sagebrush)	0.1	4
Chrysothamnus nauseosus (gray rabbitbrush)	0.3	12
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X
Erodium cicutrium[a] (storksbill)	0.1	4
Bromus tectorum[a] (cheatgrass)	7.8	100
Phaelia hastata (threadleaf scorpionweed)	X	X
Melilotus officinalis[a] (sweetclover)	X	X
Lactuca serriola[a] (prickly lettuce)	X	X
Machaeranthera canescens (hoary aster)	0.6	4
Epilobium paniculatum (tall willowherb)	0.3	12
Poa bulbosa[a] (bulbous bluegrass)	X	X
Draba verna (spring whitlow)	X	X
Agropyron dasytachyum (thickspike wheatgrass)	X	X
Stipa comata (needle-and-thread grass)	0.2	8
Tragopogon dubius[a] (yellow salsify)	X	X
Erigeron poliospermus (cushion fleabane)	X	X
Holosteum umbellatum[a] (jagged chickweed)	0.1	4
Sphaeralcea munroana (globemallow)	0.1	4
Chaenactis douglasii (hoary falseyarrow)	0.1	4
Ambrosia acanthicarpa (bur ragweed)	0.3	12
Sitanion hystrix (bottlebrush squirreltail)	3.2	16
Petalostemon ornatum (prairie clover)	X	X
Erysimum asperum (wall flower)	X	X
Sporobolus cryptandrus (sand dropseed)	X	X

Table 7. Percent Canopy Cover and Frequency of Occurrence on the 100-D/DR Liquid Sites in 2004. (2 Pages)

Species	% Cover	% Frequency
Oryzopsis hymenoides (Indian ricegrass)	1.5	4
Agropyron spicatum (bluebunch wheatgrass)	5.2	52
Penstemon acuminatus (sand beardtongue)	X	X
Astragalus caricinus (buckwheat milkvetch)	X	X
Astragalus sclerocarpus (stalked pod milkvetch)	X	X
Balsamorhiza careyana (Carey's balsamroot)	X	X
Oenothera pallida (evening primrose)	X	X
Lupinus pusillus (low lupine)	X	X
Erigeron filifolius (threadleaf fleabane)	X	X
Helianthus cusickii (Cusick's sunflower)	X	X
Astragalus purshii (woolly pod milkvetch)	X	X
Ranunculus testiculatus (bur buttercup)	X	X
Biotic crust	1.7	12
Bare soil	21	64
Litter	54.3	100
Total Cover (does not include biotic crust or litter)	**38**	

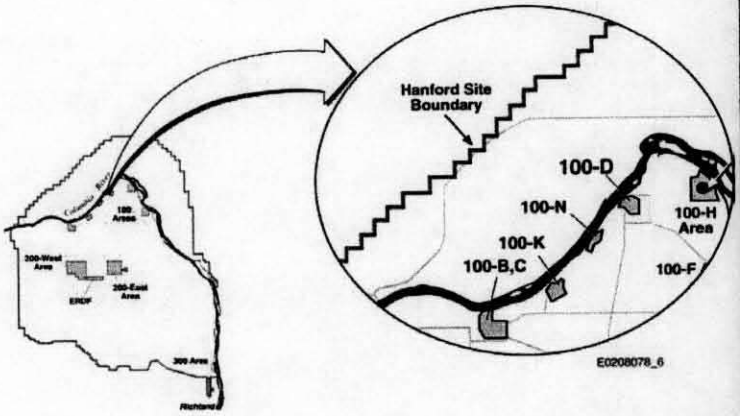
[a] Introduced species.
X = Present but not counted in plot frames
-- = Not observed on the site

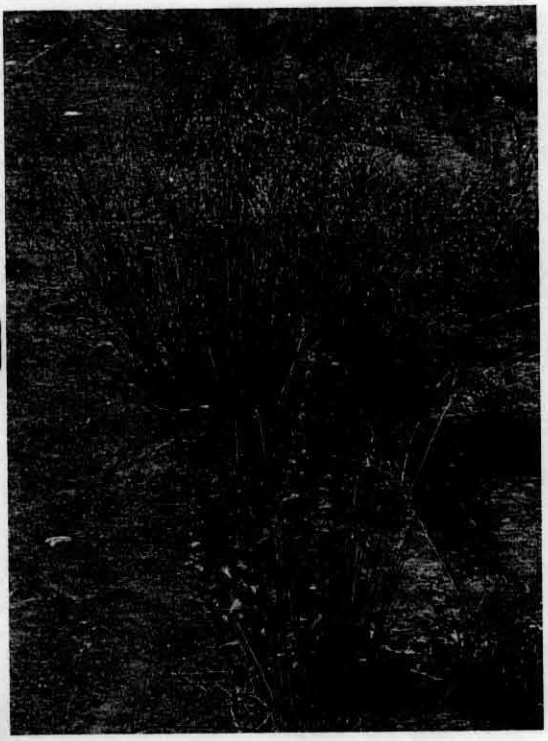
Sagebrush survival was estimated on a representative plot within the planted area in early May 2004. Of the sagebrush counted, 78.2% were still alive in 2004, down from 87.8% observed in 2003 (Table 2). While the calculated sagebrush survival is down, the overall survival remains within an acceptable rate. A majority of the planted seedlings have grown since their installation in December 2002 (Figure 7).

5.2 100-H AREA

The 100-H Fuel Storage Basin cleanout operations encountered radiologically contaminated sediments that required the use of water for contamination control measures. The ponding water attracted mud dauber wasps that used contaminated mud from the basin to build nests in various locations surrounding the 100-H reactor, including the revegetated areas. As a result, third-year vegetation analyses were not conducted on the 100-H Area sites in 2004. However, data collections from the 2003 survey can be found in Appendix A. Data collections at the 100-H Area will resume upon cleanup of the isolated wasp nests.

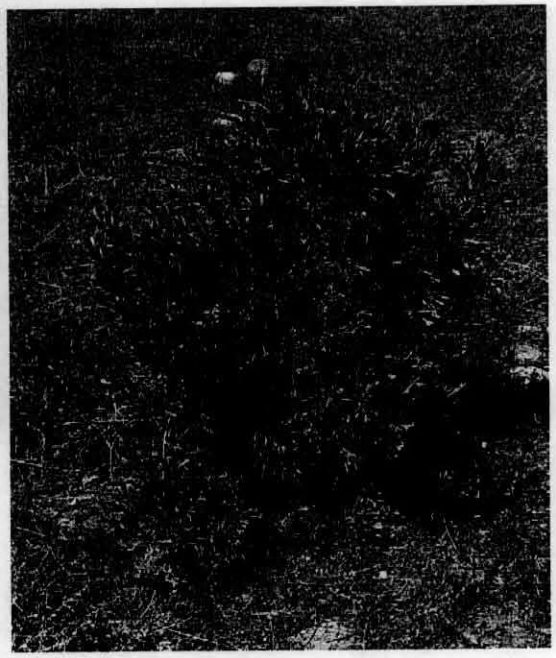
Figure 7. 100-D/DR.





Sandbeard tongue and Indian ricegrass in seed mix, May 2004.

Rabbitbrush, grasses, and Sandbeard tongue, May 2004.



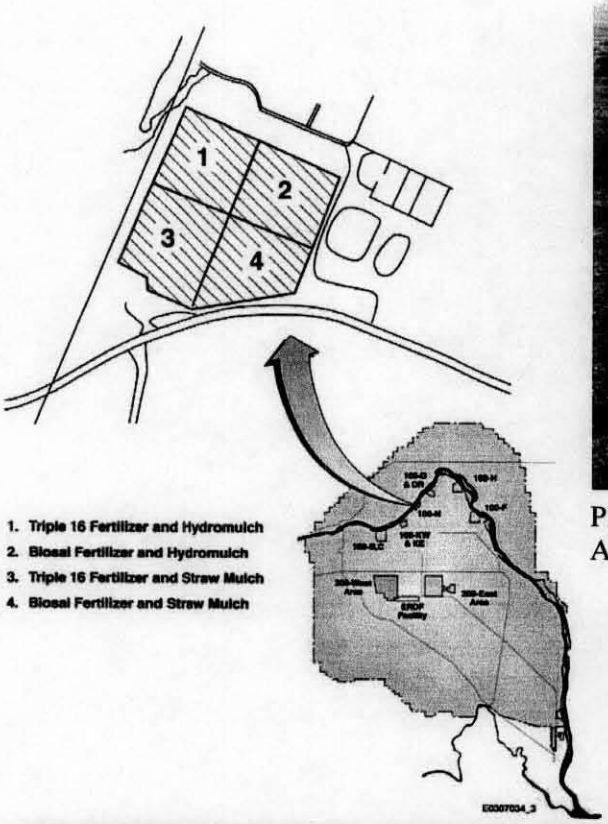
December 2001 planted sagebrush, May 2004.

6.0 120-N-1 AND 120-N-2 SITES

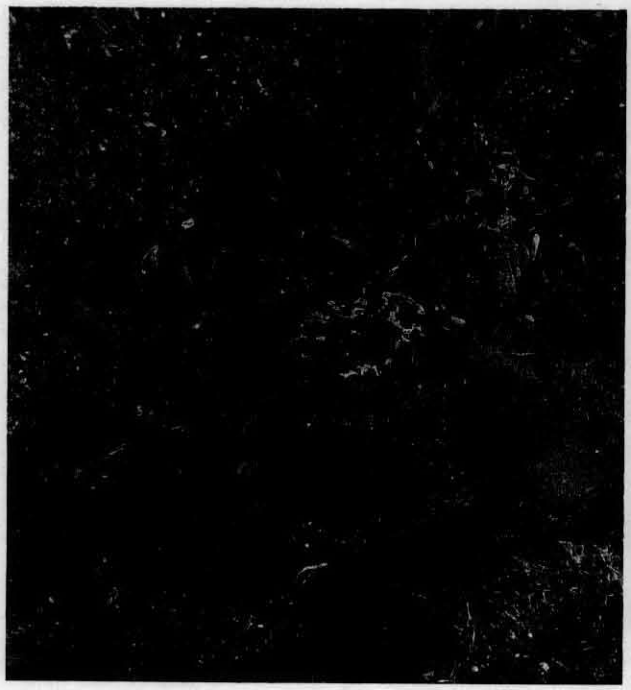
The 120-N-1 and 120-N-2 sites were operated from 1977 to 1986 and 1986 to 1988, and received non-radioactive process effluent. The two sites were remediated as part of the *Interim Remedial Action Record of Decision for the 100-NR-1 Operable Unit, Hanford Site, Benton County, Washington* (EPA 2000). Following remediation in the fall of 2002, the sites were backfilled to grade using material from a nearby borrow pit. In preparation for revegetation, the top 12.7 cm of the entire area to be seeded was ripped with a spring-tooth-drawn implement. In mid-January 2003 the 1.6-ha area was broadcast seeded with 11.2 kg/ha of Sandberg's bluegrass; 2.8 kg/ha of Indian ricegrass; 2.8 kg/ha of thickspike wheatgrass; 2.8 kg/ha of bluebunch wheatgrass; 1.12 kg/ha of needle-and-thread grass; 0.56 kg/ha of sagebrush; 0.14 kg/ha of yarrow; and small amounts of cushion fleabane, false yarrow, phlox, wallflower, and rabbitbrush seeds. One-half of the 1.6-ha area had 112 kg/ha of triple 16 fertilizer co-applied during seeding, while the remaining area was treated with Biosol, an organic, slow-release fertilizer at a rate of approximately 1,120 kg/ha. Upon completion of seeding and fertilizer application, the entire area was irrigated with 0.62 cm of water per hectare. One-half of the triple 16 fertilizer area and one-half of the Biosol treated area was hydro-mulched with industry standard mulch fiber. The remaining triple 16 fertilizer area and Biosol treated area was mulched with grass straw at approximately 4.5 metric tons per hectare and then crimped into the soil surface (Figure 8). Sagebrush tubelings will be planted on the seeded area when the additional revegetation efforts in the 100-N Area are completed.

Vegetation surveys conducted on April 14, 2004, recorded 29 species on the site, including 11 of the 12 seeded species. This year's vegetation survey found a decrease in thickspike wheatgrass cover across all treatments, with the most significant decrease on the straw mulch treatments with reductions of 31.1% and 26.4%. Species diversity and total cover remains greatest in the triple 16/straw mulch area with 24 species and 41% cover followed by the Biosol/straw mulch area with 21 species and 30.9% cover (Table 8). The triple 16/hydromulch area and Biosol/hydromulch area had 21 species and 29.4% cover and 23 species, yielding 24% total cover. Sandberg's bluegrass has the greatest canopy cover and frequency of occurrence of all the species planted with best germination and survival on the triple 16 and straw mulch treatment (Table 9). While the total canopy cover of the hydromulched areas was less, numerous false yarrow, wall flower, and yarrow seedlings were observed, most likely as a result of last year's plants production of seed. While initial vegetation analysis indicate greater success on the straw mulch treatments, caution must be used, as initial analysis is not always indicative of future performance.

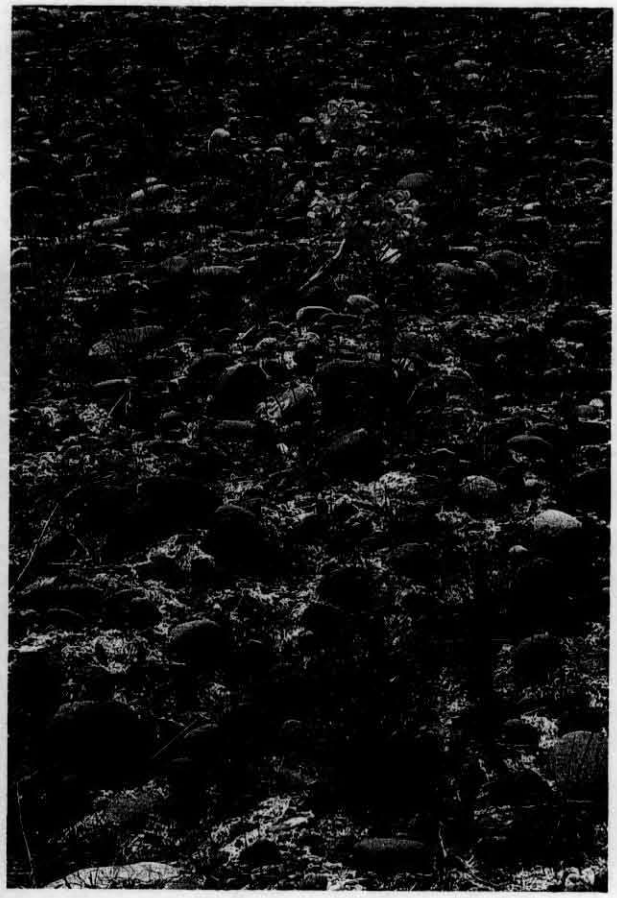
Figure 8. 120-N Sites.



Planted grass, triple 16 and straw mulch treatment, April 2004.



Numerous false yarrow seedlings on the Biosol and hydromulch treatment, April 2004.



Grasses, sagebrush, and wallflower on the triple 16 and hydromulch treatment, April 2004.

Table 8. Percent Canopy Cover on the 120-N-1 and 120-N-2 Sites in 2004.

Species	Triple 16 and Straw Mulch	Triple 16 and Hydromulch	Biosol and Straw Mulch	Biosol and Hydromulch
Argropyron dasytachum (thickspike wheatgrass)	4.3	4.4	5.0	0.5
Agropyron spicatum (bluebunch wheatgrass)	3.8	0.8	0.5	0.4
Poa sandbergii (Sandberg's bluegrass)	17.9	10.1	6.4	2.9
Stipa comata (needle-and-thread grass)	0.4	0.6	1.1	0.5
Bromus tectorum[a] (cheatgrass)	4.3	2.4	6.0	7.4
Salsola kali[a] (Russian thistle)	1.9	1.8	2.8	2.0
Achillea millefolium (yarrow)	1.4	3.0	1.9	1.6
Vulpia myuros[a] (rattail fescue)	0.4	--	--	--
Artemisia tridentata (big sagebrush)	0.4	0.1	X	X
Centaurea diffusa[a] (diffuse knapweed)	1.4	--	--	0.4
Chrysothamnus nauseosus (gray rabbitbrush)	--	0.5	--	0.3
Descurania pinnata (western tansymustard)	--	0.3	0.1	--
Epilobium paniculatum (tall willowherb)	1.1	1.8	1.8	1.4
Lactuca serriola[a] (prickly lettuce)	0.3	0.1	0.8	0.4
Sisymbrium altissimum[a] (tumblemustard)	0.5	0.6	1.3	2.1
Tragopogon dubius[a] (yellow salsify)	--	--	--	0.3
Machaeranthera canescens (hoary aster)	--	--	0.3	0.1
Chaenactis douglasii (hoary falseyarrow)	0.1	1.0	0.1	1.5
Penstemon acuminatus (sand beardtongue)	--	--	0.4	0.3
Erigeron poliospermus (cushion fleabane)	0.1	0.1	0.1	--
Oryzopsis hymenoides (Indian ricegrass)	0.4	0.3	1.0	0.3
Draba verna (spring whitlowgrass)	2.0	0.5	0.5	0.4
Holosteum umbellatum[a] (jagged chickweed)	0.1	--	--	--
Erysimum asperum (wall flower)	0.1	0.6	0.5	1.5
Amsinckia lycopsoides (tarweed fiddleneck)	0.1	--	0.1	X
Poa bulbosa[a] (bulbous bluegrass)	0.1	0.3	--	--
Ranunculus testiculatus (bur buttercup)	0.3	0.3	0.4	--
Erigerion pumilius (shaggy fleabane)	X	--	X	--
Melinotus alba[a] (sweetclover)	X	--	--	X
Bare soil	28.9	47.5	27.1	57.3
Litter	36.9	3.1	48.6	3.1
Total Cover (does not include bare soil or litter)	**41.1**	**29.4**	**30.9**	**24.0**

[a] Introduced species.
X = Present but not counted in plot frames
-- = Not observed on the site

Table 9. Percent Frequency of Occurrence on the 120-N-1 and 120-N-2 Sites in 2004.

Species	Triple 16 and Straw Mulch	Triple 16 and Hydromulch	Biosol and Straw Mulch	Biosol and Hydromulch
Argropyron dasytachum (thickspike wheatgrass)	75	55	30	20
Agropyron spicatum (bluebunch wheatgrass)	55	30	20	15
Poa sandbergii (Sandberg's bluegrass)	90	90	85	90
Stipa comata (needle-and-thread grass)	15	25	45	20
Bromus tectorum[a] (cheatgrass)	95	70	95	100
Salsola kali[a] (Russian thistle)	75	45	85	80
Achillea millefolium (yarrow)	55	95	75	65
Vulpia myuros[a] (rattail fescue)	15	--	--	--
Artemisia tridentata (big sagebrush)	15	5	X	X
Centaurea diffusa[a] (diffuse knapweed)	30	--	--	15
Chrysothamnus nauseosus (gray rabbitbrush)	--	20	--	10
Descurania pinnata (western tansymustard)	--	10	5	--
Epilobium paniculatum (tall willowherb)	45	70	70	55
Lactuca serriola[a] (prickly lettuce)	10	5	30	15
Sisymbrium altissimum[a] (tumblemustard)	20	25	50	85
Tragopogon dubius[a] (yellow salsify)	--	--	--	10
Machaeranthera canescens (hoary aster)	--	--	10	5
Chaenactis douglasii (hoary falseyarrow)	5	40	5	60
Penstemon acuminatus (sand beardtongue)	--	--	15	10
Erigeron poliospermus (cushion fleabane)	5	5	5	--
Oryzopsis hymenoides (indian ricegrass)	15	10	40	10
Draba verna (spring whitlowgrass)	55	20	20	15
Holosteum umbellatum[a] (jagged chickweed)	5	--	--	--
Erysimum asperum (wall flower)	5	25	20	60
Amsinckia lycopsoides (tarweed fiddleneck)	5	--	5	X
Poa bulbosa[a] (bulbous bluegrass)	5	10	--	--
Ranunculus testiculatus (bur buttercup)	10	10	15	--
Erigerion pumilius (shaggy fleabane)	X	--	X	
Melinotus alba[a] (sweetclover)	X	--	--	X
Bare soil	100	100	100	100
Litter	100	100	100	100

[a] Introduced species.
X = Present but not counted in plot frames
-- = Not observed on the site

7.0 ERDF MITIGATION

In December 2002, the DOE Richland Operations Office and U.S. Fish and Wildlife Service cooperatively worked on a compensatory mitigation planting project for the original construction of the ERDF Cells 1 and 2 on the ALE Reserve. Approximately 68.8 ha of mature sagebrush habitat was lost during the facility construction. The BRMaP (DOE-RL 2001) requires that if more than 1 ha (2.47 acres) of high-quality habitat is destroyed, compensatory mitigation must take place at a rate of 3:1.

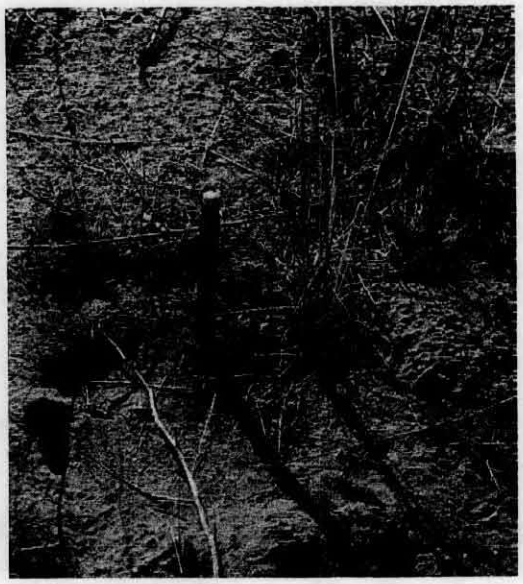
The ERDF mitigation project included three separate planting elements completed in the winter of 2002 and 2003. The native grass seeding was completed in December 2002, and the native shrub seedling plantings were completed in the winter of 2002 and 2003. The native grass plug planting was also completed in the winter of 2003.

The native grass seed used in the seeding project was purchased from a local seed producer and derived from local sources. Prior to seeding approximately 64.8 ha with native grasses, an application of Roundup® was aerial applied to the seeding area in mid-November 2002. Following the aerial herbicide application, in mid-December 2002, 22.4 kg/ha of native grass seed mix consisting of Sandberg's bluegrass, thickspike wheatgrass, bottlebrush squirreltail, Indian ricegrass, and needle-and-thread grass was aerial broadcast and then harrowed with a tractor-drawn implement. An additional Roundup application was applied in mid-February 2003 to reduce cheatgrass competition to the seeded species.

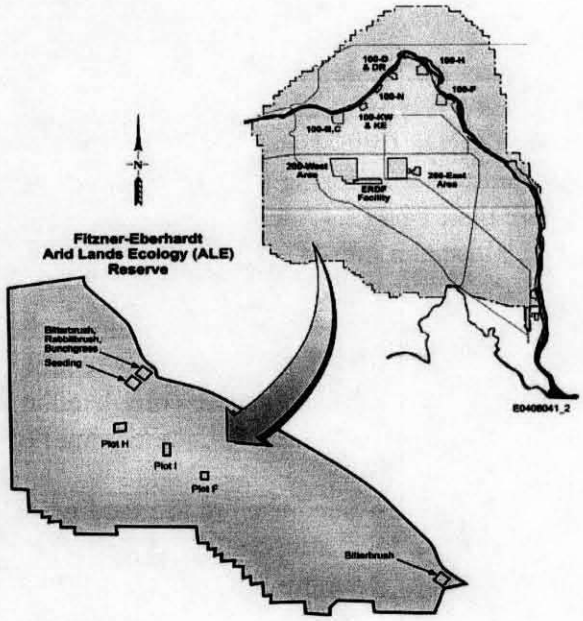
Approximately 139,000 shrubs were planted across 125.5 ha in early December 2002. The shrubs planted included 10,300 10-in^3, 28,100 4-in^3, and 93,000 bareroot sagebrush; 6,000 green rabbitbrush; and 6,000 gray rabbitbrush. The bareroot plants were dipped in mycorrhizal root gel prior to planting to provide the plants nutrients required for plant establishment. The shrubs were planted in three separate areas along the 1200 ft rd and identified as plots F, H, and I on figure 9, and were monitored for survival. The remaining shrub and grass plug plantings were completed in the winter of 2003. Two areas were planted, one included planting native grass and shrub plugs adjacent to and north of the 2002 broadcast seeded area. A mixture of bitterbrush, green and gray rabbitbrush, Indian ricegrass, and needle-and-thread grass was planted over a 14.1-ha area (Figure 9). Approximately 10,000 thickspike wheatgrass plugs were planted separately just west of the shrub planting area. The other area planted in the winter of 2003 is located within the northeast corner of the ALE Reserve. This area was planted with bitterbrush tubelings. Since bitterbrush is susceptible to browsing, the plants were either protected with biodegradable mesh tubes anchored with bamboo stakes or treated with a foliar solution of animal repellant to evaluate alternative browse protection. Each protection method will be monitored to evaluate protectiveness.

® Roundup is a registered trademark of Monsanto Technology LLC, St. Louis, Missouri.

Figure 9. ERDF Mitigation.



December 2003 planted grass plug,
August 2004.



December 2003 planted green rabbitbrush
forming flower buds, August 2004.

December 2002 planted 4-in^3 sagebrush,
August 2004.

All the ERDF mitigation plantings are monitored annually to document the planting success, plant establishment, and shrub survival with data collections included in the annual revegetation monitoring report.

Monitoring plots were installed within the sagebrush plots in the spring of 2003. Four plots were established within the sagebrush planting areas; one plot each within Areas F and H, which were planted with bareroot seedlings, and the remaining two plots on Area I. One plot within Area I containing 10-in^3 sagebrush tubelings was established and the other plot containing 4-in^3 planted sagebrush tubelings was established. Two monitoring plots were installed in the spring of 2004 within the bitterbrush, rabbitbrush, and grass plug areas, one located adjacent to the broadcast seeded area and one located in the northeast corner of the ALE Reserve that were planted in the winter of 2003. All plants within the monitoring transects were staked with an 18-in.-long piece of 1/2-in. white PVC pipe in early April before the stress of summer heat. The white pipe allowed for quick and easy survival counts.

In mid-August all marked plants were examined for survival, yielding an estimated survival per sagebrush seedling type. Results of survival counts are provided in Table 10. Sagebrush survival is down across all three seedling types compared to 2003 data the lowest survival recorded for the 10-in^3 tubeling size at 24.6% and the highest survival observed for the 4-in^3 tubeling plot with 51.7% survival. The bitterbrush plants treated with animal repellant had an estimated survival of 25.7% compared to 36.8% observed on the bitterbrush planted in the same area and protected with biodegradable mesh tubes. While greater mortality was observed for the repellant-treated plants, it was not due to browsing, as none of the bitterbrush seedlings within the monitoring plot had been browsed. It is important to note that some of the bitterbrush leaves were completely brown; however, new leaves were starting to emerge on some of the plants. Shrub survival is based on the plant having any green leaves. Therefore, the bitterbrush survival estimates may increase next year, as some plants may have been counted as dead if new leaves had not yet started to emerge. The rabbitbrush within the monitoring plot had mixed vigor. Some of the plants had notable branching and foliar growth, with a few plants even forming flower buds, while others had little or no new growth.

Table 10. Percent Survival of ERDF Mitigation Transplants.

Site	2003	2004
10 in^3 Sagebrush	65.6	24.6
4 in^3 Sagebrush	76.7	51.7
Bareroot Sagebrush	57.9	36.8
Bitterbrush (mesh tubes)	--	38.6
Bitterbrush (animal repellant)	--	25.7
Rabbitbrush	--	77.1
Bunchgrass	--	53.7
Thickspike wheatgrass	--	72.5

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APPENDIX A

2003 REVEGETATION MONITORING RESULTS

Appendix A – 2003 Revegetation Monitoring Results

Table A-1. Percent Canopy Cover and Frequency of Occurrence on the 600-23 Site in 2003.

Species	% Cover	% Frequency
Vulpia myuros[a] (rattail fescue)	19	92
Poa sandbergii (Sandberg's bluegrass)	2.6	84
Bromus tectorum[a] (cheatgrass)	5.8	80
Salsola kali[a] (Russian thistle)	1.8	52
Achillea millefolium (yarrow)	0.6	24
Melilotus alba[a] (sweetclover)	0.1	4
Eriogonum niveum (snow buckwheat)	0.1	4
Stipa comata (needle-and-thread grass)	0.3	12
Agropyron sp. (wheatgrass)	4.2	52
Artemisia tridentata (sagebrush)	X	X
Festuca octoflora (slender sixweeks)	1.3	32
Gilia leptomeria (Great Basin gilia)	X	X
Sisymbrium altissimum[a] (tumblemustard)	0.9	36
Holosteum umbellatum[a] (jagged chickweed)	0.1	4
Lactuca seriola[a] (prickly lettuce)	X	X
Amsinckia lycopsoides (tarweed fiddleneck)	X	X
Phacelia hastata (whiteleaf scorpionweed)	X	X
Ambrisia acanthicarpa (bur ragweed)	X	X
Poa bulbosa[a] (bulbous bluegrass)	0.8	12
Chaenactis douglassii (hoary falseyarrow)	X	X
Purshia tridentata (bitterbrush)	X	X
Machaeranthera canescens (hoary aster)	0.1	4
Draba verna (spring whitlow)	0.6	24
Epilobium panuculatum (tall willowherb)	0.3	12
Astragalus sclerocarpus (stalk-pod milkvetch)	0.1	4
Phacelia linearis (threadleaf scorpionweed)	0.1	4
Penstemon acuminatus (sand beardtongue)	X	X
Layia grandulosa (white daisy tidytips)	X	X
Helianthus cusickii (Cusick's sunflower)	X	X
Erodium cicutarium[a] (storksbill)	X	X
Chrysothamnus nauseosus (gray rabbitbrush)	X	X
Bare soil	53.2	100
Litter	19.6	100
Total cover (does not include bare soil or litter)	**19.8**	

[a] Introduced species.
X = present but not counted in plot frames

Table A-2. Percent Canopy Cover and Frequency of Occurrence on the J.A. Jones Site in 2003.

Species	% Cover	% Frequency
Argropyron dasytachum (thickspike wheatgrass)	5.4	44
Bromus tectorum[a] (cheatgrass)	12.9	96
Salsola kali[a] (Russian thistle)	1.4	56
Poa sandbergii (Sandberg's bluegrass)	20.2	100
Achillea millefolium (yarrow)	1.6	44
Amsinckia lycopsoides (tarweed fiddleneck)	8.1	92
Artemisia tridentata (big sagebrush)	X	X
Purshia tridentata (bitterbrush)	X	X
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	4
Eriogonum niveum (snow buckwheat)	0.2	8
Erodium cicutarium[a] (storksbill)	2	60
Lactuca serriola[a] (prickly lettuce)	X	X
Festuca octoflora (slender sixweeks)	1.4	36
Sisymbrium altissimum[a] (tumblemustard)	2.1	64
Machaeranthera canescens (hoary aster)	0.2	8
Chaenactis douglasii (hoary falseyarrow)	0.1	4
Microsteris gracilis (pink microsteris)	0.2	8
Penstemon acuminatus (sand beardtongue)	X	X
Balsamorhiza careyana (Carey's balsamroot)	X	X
Phlox longifolia (longleaf phlox)	0.1	4
Ambrosia acanthicarpa (bur ragweed)	1.2	48
Draba verna (spring whitlowgrass)	1.2	28
Holosteum umbellatum[a] (jagged chickweed)	2.1	84
Cryptantha circumscissa (matted cryptantha)	0.1	4
Erysimum asperum (wallflower)	0.2	8
Stipa comata (needle-and-thread grass)	0.4	16
Hordeum leporinum[a] (Hare barley)	0.6	4
Erigeron poliospermus (cushion fleabane)	0.1	4
Astragalus succumbens (crouching milkvetch)	0.1	4
Gilia leptomeria (Great Basin Gilia)	X	X
Descurania pinnata (western tansymustard)	0.1	4
Epilobium paniculatum (tall willowherb)	X	X
Tragopogon dubius[a] (yellow salsify)	X	X
Bare soil	44.2	100
Litter	22.6	100
Total cover (does not include bare soil or litter)	62.1	

[a] Introduced species.
X = present but not counted in plot frames

Appendix A – 2003 Revegetation Monitoring Results

Table A-3. Percent Canopy Cover on the 100-B/C Revegetation Sites in 2003.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	28.0	26.3	21.9	4.9
Eriogonum niveum (snow buckwheat)	3.3	3.4	4.1	1.3
Salsola kali[a] (Russian thistle)	0.2	0.3	0.6	0.6
Achillea millefolium (yarrow)	1.0	0.4	0.4	0.1
Sisymbrium altissimum[a] (tumblemustard)	X	0.1	--	0.1
Descurainia pinnata (western tansymustard)	0.4	0.3	0.8	--
Centaurea diffusa[a] (diffuse knapweed)	X	0.1	X	X
Artemisia tridentata (big sagebrush)	0.3	0.3	0.2	--
Chrysothamnus nauseosus (gray rabbitbrush)	0.6	0.6	0.1	0.6
Chrysothamnus viscidiflorus (green rabbitbrush)	0.1	--	X	X
Balsamorhiza careyana (Carey's balsamroot)	0.1	X	X	X
Bromus tectorum[a] (cheatgrass)	2.3	8.2	4	15.1
Lactuca serriola[a] (prickly lettuce)	X	X	0.1	--
Machaeranthera canescens (hoary aster)	0.2	0.2	0.2	--
Epilobium paniculatum (tall willowherb)	0.1	0.4	0.3	0.3
Medicago sativa[a] (alfalfa)	X	0.1	X	X
Agropyron dasytachyum (thickspike wheatgrass)	0.8	--	--	--
Stipa comata (needle-and-thread grass)	0.2	0.7	0.8	X
Tragopogon dubius[a] (yellow salsify)	0.1	--	0.1	--
Erigeron poliospermus (cushion fleabane)	X	X	--	--
Erigeron piperianus (piper's daisy)	X	--	--	X
Holosteum umbellatum[a] (jagged chickweed)	--	--	--	X
Vulpia myuros[a] (rattail fescue)	X	0.6	--	0.4
Agropyron cristatum[a] (crested wheatgrass)	X	0.3	--	--
Ambrosia acanthicarpa (bur ragweed)	--	--	X	--
Erodium cicutrium[a] (storksbill)	--	--	--	X
Agropyrom spicatum (bluebunch wheatgrass)	0.3	3.9	2.7	0.3
Festuca octoflora (six weeks fescue)	0.1	--	0.1	--
Sphaeralcea munroana (globemallow)	X	--	--	--
Bare soil	45.8	38.3	38.6	47.0
Litter	15.8	19.6	38.6	12.1
Total cover (does not include bare soil or litter)	**38.1**	**46.3**	**36.4**	**23.6**

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

Table A-4. Percent Frequency of Occurrence on the 100-B/C Revegetation Sites in 2003.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	96	100	96	95
Eriogonum niveum (snow buckwheat)	72	76	84	50
Salsola kali[a] (Russian thistle)	8	12	24	25
Achillea millefolium (yarrow)	40	16	16	5
Sisymbrium altissimum[a] (tumblemustard)	X	4	--	5
Descurainia pinnata (western tansymustard)	16	12	32	--
Centaurea diffusa[a] (diffuse knapweed)	X	4	X	--
Artemisia tridentata (big sagebrush)	12	12	8	--
Chrysothamnus nauseosus (gray rabbitbrush)	24	24	4	25
Chrysothamnus viscidiflorus (green rabbitbrush)	4	--	X	--
Balsamorhiza careyana (Carey's balsamroot)	4	X	X	--
Bromus tectorum[a] (cheatgrass)	52	80	64	100
Lactuca serriola[a] (prickly lettuce)	X	X	4	--
Machaeranthera canescens (hoary aster)	8	8	8	--
Epilobium paniculatum (tall willowherb)	4	16	12	10
Microsteris gracilis (annual phlox)	--	4	--	--
Medicago sativa[a] (alfalfa)	X	4	X	--
Agropyron dasytachyum (thickspike wheatgrass)	12	--	--	--
Stipa comata (needle-and-thread grass)	8	8	12	--
Tragopogon dubius[a] (yellow salsify)	4	--	4	--
Erigeron poliospermus (cushion fleabane)	X	X	0	--
Erigeron piperianus (piper's daisy)	X	--	--	--
Vulpia myuros[a] (rattail fescue)	X	4	--	15
Agropyron cristatum[a] (crested wheatgrass)	X	12	--	--
Ambrosia acanthicarpa (bur ragweed)	--	--	X	--
Erodium cicutrium[a] (storksbill)	--	--	--	X
Agropyrom spicatum (bluebunch wheatgrass)	12	40	48	10
Festuca octoflora (six weeks fescue)	4	--	4	--
Sphaeralcea munroana (globemallow)	X	--	--	--
Bare soil	100	100	100	100
Litter	100	100	100	100

[a] Introduced species.
X= present but not counted in plot frames
--= not present on site

Table A-5. Percent Canopy Cover and Frequency of Occurrence on the 100-D/DR Liquid Sites in 2003.

Species	% Cover	% Frequency
Vulpia myuros[a] (rattail fescue)	23.8	80
Poa sandbergii (Sandberg's bluegrass)	4.7	43.3
Eriogonum niveum (snow buckwheat)	X	X
Salsola kali[a] (Russian thistle)	1	40
Achillea millefolium (yarrow)	0.5	20
Sisymbrium altissimum[a] (tumblemustard)	2.9	53.3
Amsinckia lycopsoides (tarweed fiddleneck)	1.8	6.7
Centaurea diffusa[a] (diffuse knapweed)	0.2	6.7
Artemisia tridentata (big sagebrush)	0.1	3.3
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	3.3
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X
Erodium cicutrium[a] (storksbill)	0.2	6.7
Bromus tectorum[a] (cheatgrass)	29	93.3
Phaelia hastata (threadleaf scorpionweed)	X	X
Melilotus officinalis[a] (sweetclover)	X	X
Lactuca serriola[a] (prickly lettuce)	X	X
Machaeranthera canescens (hoary aster)	X	X
Epilobium paniculatum (tall willowherb)	0.2	6.7
Poa bulbosa[a] (bulbous bluegrass)	0.7	10
Draba verna (spring whitlow)	0.7	10
Stipa comata (needle-and-thread grass)	X	X
Tragopogon dubius[a] (yellow salsify)	X	X
Lepidium perfoliatum[a] (clasping pepperweed)	0.2	6.7
Holosteum umbellatum[a] (jagged chickweed)	0.3	13.3
Chaenactis douglasii (hoary falseyarrow)	X	X
Ambrosia acanthicarpa (bur ragweed)	0.9	20
Sitanion hystrix (bottlebrush squirltail)	3.7	20
Festuca octoflora (slender sixweeks)	0.1	3.3
Hordeum leporinum[a] (Hare barley)	0.3	10
Taeniatherum asperum[a] (Medusahead)	0.1	3.3
Sphaeralcea munroana (globemallow)	0.1	3.3
Sporobolus cryptandrus (sanddrop seed)	X	X
Oryzopsis hymenoides (Indian ricegrass)	X	X
Agropyrom spicatum (bluebunch wheatgrass)	X	X
Penstemon acuminatus (sand beardtounge)	X	X
Astragalus caricinus (buckwheat milkvetch)	X	X
Bare soil	38.5	100
Litter	49.1	100
Total cover (does not include bare soil or litter)	**71.3**	

[a] Introduced species.
X = present but not counted in plot frames

Table A-6. Percent Canopy Cover and Frequency of Occurrence on the 100-H Revegetation Sites in 2003.

Species	% Cover	Frequency
Poa sandbergii (Sandberg's bluegrass)	3.7	68
Eriogonum niveum (snow buckwheat)	X	X
Salsola kali[a] (Russian thistle)	0.2	8
Achillea millefolium (yarrow)	0.1	4
Sisymbrium altissimum[a] (tumblemustard)	0.6	24
Descurainia pinnata (western tansymustard)	0.1	4
Artemisia tridentata (big sagebrush)	0.1	4
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	4
Bromus tectorum[a] (cheatgrass)	3	60
Lactuca serriola[a] (prickly lettuce)	X	X
Machaeranthera canescens (hoary aster)	X	X
Epilobium paniculatum (tall willowherb)	0.1	4
Microsteris gracilis (annual phlox)	X	X
Poa bulbosa[a] (bulbous bluegrass)	0.6	4
Draba verna (spring whitlow)	0.2	8
Agropyron spicatum (bluebunch wheatgrass)	0.7	8
Stipa comata (needle-and-thread grass)	X	X
Tragopogon dubius[a] (yellow salsify)	X	X
Erigeron poliospermus (cushion fleabane)	X	X
Erigeron filifolius (threadleaf fleabane)	X	X
Holosteum umbellatum[a] (jagged chickweed)	0.1	4
Vulpia myuros[a] (rattail fescue)	28.5	100
Erodium cicutrium[a] (storksbill)	X	X
Hordeum leporinum[a] (Hare barley)	X	X
Erysimum asperum (rough wallflower)	X	X
Ambrosia acanthicarpa (bur ragweed)	X	X
Lepidium perfoliatum[a] (clasping pepperweed)	X	X
Sitanion hystrix (bottlebrush squireltail)	X	X
Penstemon acuminatus (sand beardtounge)	X	X
Chaenactis douglasii (hoary falseyarrow)	X	X
Bare soil	34.3	88
Litter	49.7	96
Total cover (does not include bare soil or litter)	**38.1**	

[a] Introduced species.
X = present but not counted in plot frames

Table A-7. Percent Canopy Cover on the 120-N-1 and 120-N-2 Sites in 2003.

Species	Triple 16 and Straw Mulch	Triple 16 and Hydromulch	Biosol and Straw Mulch	Biosol and Hydromulch
Argropyron dasytachum (thickspike wheatgrass)	35.4	13.1	31.4	2.6
Agropyron spicatum (bluebunch wheatgrass)	1.9	0.8	0.4	X
Poa sandbergii (Sandberg's bluegrass)	16.0	4.4	3.4	X
Stipa comata (needle-and-thread grass)	0.6	--	0.3	--
Bromus tectorum[a] (cheatgrass)	0.8	0.9	0.4	0.6
Salsola kali[a] (Russian thistle)	3.4	7.1	4.1	14.3
Achillea millefolium (yarrow)	3.8	1.6	0.6	0.1
Vulpia myuros[a] (rattail fescue)	4.5	--	1.3	--
Artemisia tridentata (big sagebrush)	0.5	0.1	0.1	X
Centaurea diffusa[a] (diffuse knapweed)	0.5	0.3	2.1	0.1
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	--	--	--
Festuca octoflora (slender sixweeks)	0.1	--	--	--
Sisymbrium altissimum[a] (tumblemustard)	X	X	--	X
Machaeranthera canescens (hoary aster)	0.1	0.4	--	X
Chaenactis douglasii (hoary falseyarrow)	0.1	0.3	X	0.8
Phlox longifolia (longleaf phlox)	--	X	--	--
Amaranthus albus[a] (pigweed)	0.1	--	--	X
Erigeron poliospermus (cushion fleabane)	0.1	0.3	--	--
Oryzopsis hymenoides (Indian ricegrass)	--	--	0.1	--
Erysimum asperum (rough wallflower)	--	--	X	--
Bare soil	26.1	55.9	19.5	58.5
Litter	54.5	22.6	61.0	25.0
Total Cover (does not include bare soil or litter)	**68.0**	**29.1**	**44.1**	**18.5**

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

Table A-8. Percent Frequency of Occurrence on the 120-N-1 and 120-N-2 Sites in 2003.

Species	Triple 16 and Straw Mulch	Triple 16 and Hydromulch	Biosol and Straw Mulch	Biosol and Hydromulch
Argropyron dasytachum (thickspike wheatgrass)	100	95	100	80
Agropyron spicatum (bluebunch wheatgrass)	25	30	15	X
Poa sandbergii (Sandberg's bluegrass)	85	75	60	X
Stipa comata (needle-and-thread grass)	25	--	10	--
Bromus tectorum[a] (cheatgrass)	30	10	15	25
Salsola kali[a] (Russian thistle)	85	90	65	90
Achillea millefolium (yarrow)	75	65	25	5
Vulpia myuros[a] (rattail fescue)	55	--	25	--
Artemisia tridentata (big sagebrush)	20	5	5	X
Centaurea diffusa[a] (diffuse knapweed)	20	10	15	100
Chrysothamnus nauseosus (gray rabbitbrush)	5	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	--	--	--
Festuca octoflora (slender sixweeks)	5	--	--	--
Sisymbrium altissimum[a] (tumblemustard)	X	X	--	X
Machaeranthera canescens (hoary aster)	5	15	--	X
Chaenactis douglasii (hoary falseyarrow)	5	10	X	5
Phlox longifolia (longleaf phlox)	--	X	--	--
Amaranthus albus[a] (pigweed)	5	--	--	X
Erigeron poliospermus (cushion fleabane)	5	10	--	--
Oryzopsis hymenoides (Indian ricegrass)	--	--	5	--
Erysimum asperum (rough wallflower)	--	--	X	--
Bare soil	100	100	95	100
Litter	100	100	100	100

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

APPENDIX B

2002 REVEGETATION MONITORING RESULTS

Appendix B – 2002 Revegetation Monitoring Results

Table B-1. Percent Canopy Cover and Frequency of Occurrence on the 600-23 Site in 2002.

Species	% Cover	% Frequency
Poa sandbergii (Sandberg's bluegrass)	3.7	88
Bromus tectorum[a] (cheatgrass)	0.4	16
Salsola kali[a] (Russian thistle)	2.4	76
Achillea millefolium (yarrow)	1.6	64
Melilotus alba[a] (sweetclover)	0.4	16
Eriogonum niveum (snow buckwheat)	0.2	8
Stipa comata (needle-and-thread grass)	0.2	8
Agropyron dasytacum (thickspike wheatgrass)	2.1	84
Artemisia tridentata (sagebrush)	0.1	4
Festuca octoflora (slender six-weeks)	0.1	4
Gilia leptomeria (Great Basin gilia)	0.2	8
Sisymbrium altissimum[a] (tumble mustard)	0.1	4
Holosteum umbellatum[a] (jagged chickweed)	X	
Lactuca seriola[a] (prickly lettuce)	X	
Amsinckia lycopsoides (tarweed fiddleneck)	X	
Phacelia hastata (whiteleaf scorpionweed)	X	
Ambrisia acanthicarpa (bur ragweed)	X	
Poa bulbosa[a] (bulbous bluegrass)	X	
Chaenactis douglassii (hoary false yarrow)	X	
Purshia tridentata (bitterbrush)	X	
Mentzelia laevicaulis (blazing star)	X	
Bare soil	52.7	92
Litter (straw mulch)	25.3	96
Total cover (does not include bare soil or litter)	**11.5**	

[a] Introduced species.
X = present but not counted in plot frames

Table B-2. Percent Canopy Cover and Frequency of Occurrence on the J.A. Jones Site in 2002.

Species	% Cover	% Frequency
Argropyron dasytachum (thickspike wheatgrass)	32.1	100
Bromus tectorum[a] (cheatgrass)	6.2	72
Salsola kali[a] (Russian thistle)	11.7	100
Poa sandbergii (Sandberg's bluegrass)	2.2	88
Achillea millefolium (yarrow)	1.4	56
Amsinckia lycopsoides (tarweed fiddleneck)	1.2	48
Artemisia tridentata (big sagebrush)	X	X
Purshia tridentata (bitterbrush)	X	X
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	4
Eriogonum niveum (snow buckwheat)	X	X
Erodium cicutarium[a] (storksbill)	0.2	8
Lactuca serriola[a] (prickly lettuce)	X	X
Festuca octoflora (slender six-weeks)	0.4	16
Sisymbrium altissimum[a] (tumblemustard)	14	84
Machaeranthera canescens (hoary aster)	X	X
Chaenactis douglasii (hoary false yarrow)	0.3	12
Petalostemon ornatum (western prairieclover)	X	X
Microsteris gracilis (pink microsteris)	X	X
Penstemon acuminatus (sand beardtongue)	X	X
Balsamorhiza careyana (Carey's balsamroot)	0.1	4
Mentzelia laevicaulis (blazing star)	X	X
Plantago patagonica (Indian wheat)	X	X
Phlox longifolia (long-leaf phlox)	X	X
Oenothera pallida (pale evening primrose)	0.4	16
Ambrosia acanthicarpa (bur ragweed)	2.1	64
Draba verna (spring whitlowgrass)	0.3	12
Holosteum umbellatum[a] (jagged chickweed)	0.7	28
Melilotus officinalis[a] (sweetclover)	X	X
Amaranhus albus[a] (pigweed)	X	X
Bare soil	53.8	96
Litter	36.1	100
Total cover (does not include bare soil or litter)	**73.4**	

[a] Introduced species.
X = present but not counted in plot frames

Table B-3. Percent Canopy Cover on the 100-B/C Revegetation Sites in 2002.

Species	116-C-5	116-B-11	(16-16-16)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	18.5	14.4	12.6	3.7
Eriogonum niveum (snow buckwheat)	5.7	3.7	2.7	2
Salsola kali[a] (Russian thistle)	0.6	0.1	0.4	0.4
Achillea millefolium (yarrow)	0.9	0.6	0.2	0.3
Sisymbrium altissimum[a] (tumblemustard)	0.1	0.3	0.1	0.2
Descurainia pinnata (western tansymustard)	0.5	X	--	0.3
Centaurea diffusa[a] (diffuse knapweed)	X	0.1	X	X
Artemisia tridentata (big sagebrush)	0.4	0.3	0.2	X
Chrysothamnus nauseosus (gray rabbitbrush)	0.8	0.9	0.2	0.8
Chrysothamnus viscidiflorus (green rabbitbrush)	0.2	--	--	X
Balsamorhiza careyana (Carey's balsamroot)	0.2	0.1	X	0.1
Bromus tectorum[a] (cheatgrass)	1.0	2.2	1.2	5.4
Lactuca serriola[a] (prickly lettuce)	X	--	0.1	--
Machaeranthera canescens (hoary aster)	0.1	--	X	0.1
Epilobium paniculatum (tall willowherb)	0.3	0.5	--	0.4
Poa bulbosa[a] (bulbous bluegrass)	--	--	--	0.1
Draba verna (spring whitlow)	--	0.1	--	0.1
Medicago sativa[a] (alfalfa)	X	--	0.1	X
Agropyron dasytachyum (thickspike wheatgrass)	2.4	1.9	3.2	1
Stipa comata (needle-and-thread grass)	0.2	--	0.2	0.1
Tragopogon dubius[a] (yellow salsify)	0.1	0.1	0.1	X
Erigeron poliospermus (cushion fleabane)	0.1	0.2	--	--
Erigeron piperianus (Piper's daisy)	0.1	--	--	--
Holosteum umbellatum[a] (jagged chickweed)	0.1	--	--	0.1
Agropyron cristatum[a] (crested wheatgrass)	X	0.3	0.1	0.1
Erodium cicutrium[a] (storksbill)	0.1	0.2	--	--
Chaenactis douglasii (hoary false yarrow)	X	--	--	--
Agastachea occidentalis[a] (western horsemint)	X	--	--	--
Bare soil	53.6	55	47.9	63.2
Litter	27.7	26.6	35.8	19.7
Total cover (does not include bare soil or litter)	**31.8**	**26.0**	**21.5**	**15.2**

[a] Introduced species.
X=present but not counted in plot frames
--=not present on site

Table B-4. Percent Frequency of Occurrence on the 100-B/C Revegetation Sites in 2002.

Species	116-C-5	116-B-11 (Triple-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	100	100	100	88
Eriogonum niveum (snow buckwheat)	90	52	48	60
Salsola kali[a] (Russian thistle)	22	4	16	16
Achillea millefolium (yarrow)	36	24	8	12
Sisymbrium altissimum[a] (tumblemustard)	2	12	4	8
Descurainia pinnata (western tansymustard)	18	X	--	12
Centaurea diffusa[a] (diffuse knapweed)	X	4	X	X
Artemisia tridentata (big sagebrush)	16	12	8	X
Chrysothamnus nauseosus (gray rabbitbrush)	22	36	8	32
Chrysothamnus viscidiflorus (green rabbitbrush)	6	--	--	X
Balsamorhiza careyana (Carey's balsamroot)	8	4	X	4
Bromus tectorum[a] (cheatgrass)	40	48	48	96
Oryzopsis hymenoides (Indian ricegrass)	--	X	4	--
Melilotus officinalis[a] (sweetclover)	X	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	--	4	--
Machaeranthera canescens (hoary aster)	2	--	X	4
Epilobium paniculatum (tall willowherb)	10	20	--	16
Poa bulbosa[a] (bulbous bluegrass)	--	--	--	4
Draba verna (spring whitlow)	--	4	--	4
Medicago sativa (alfalfa)	X	--	4	X
Agropyron dasytachyum (thickspike wheatgrass)	46	56	68	20
Stipa comata (needle-and-thread grass)	8	--	8	4
Tragopogon dubius (yellow salsify)	2	4	4	X
Erigeron poliospermus (cushion fleabane)	2	8	--	--
Erigeron piperianus (Piper's daisy)	4	--	--	--
Holosteum umbellatum[a] (jagged chickweed)	2	--	--	4
Agropyron cristatum[a] (crested wheatgrass)	X	12	4	4
Erodium cicutrium[a] (storksbill)	2	8	--	--
Chaenactis douglasii (hoary false yarrow)	X	--	--	--
Agastachea occidentalis[a] (western horsemint)	X	--	--	--
Bare soil	98	100	96	100
Litter	98	100	100	100

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

Table B-5. Percent Canopy Cover and Frequency of Occurrence on the 100-D/DR Sites in 2002.

Species	% Cover	% Frequency
Poa sandbergii (Sandberg's bluegrass)	3.2	76
Salsola kali[a] (Russian thistle)	13.1	98
Achillea millefolium (yarrow)	0.4	16
Sisymbrium altissimum[a] (tumblemustard)	1.7	48
Descurainia pinnata (western tansymustard)	0.5	10
Amsinckia lycopsoides (tarweed fiddleneck)	0.3	12
Centaurea diffusa[a] (diffuse knapweed)	X	X
Artemisia tridentata (big sagebrush)	0.1	4
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	2
Chrysothamnus viscidiflorus (green rabbitbrush)	X	X
Erodium cicutrium[a] (storksbill)	X	X
Bromus tectorum[a] (cheatgrass)	2.9	58
Phaelia linearis (threadleaf scorpionweed)	X	X
Melilotus officinalis[a] (sweetclover)	X	X
Lactuca serriola[a] (prickly lettuce)	0.3	12
Machaeranthera canescens (hoary aster)	X	X
Epilobium paniculatum (tall willowherb)	0.1	2
Senecio vulgaris[a] (common groundsel)	X	X
Poa bulbosa[a] (bulbous bluegrass)	0.1	2
Draba verna (spring whitlow)	0.2	8
Agropyron dasytachyum (thickspike wheatgrass)	5.6	64
Stipa comata (needle-and-thread grass)	X	X
Lepidium perfoliatum (clasping pepperweed)	X	X
Holosteum umbellatum (jagged chickweed)	0.5	20
Mentzelia albicaulis (whitestem stickleaf)	X	X
Ranunculus testiculatus (bur buttercup)	0.3	12
Sphaeralcea munroana (globemallow)	0.1	2
Chaenactis douglasii (hoary false yarrow)	X	X
Ambrosia acanthicarpa (bur ragweed)	0.1	2
Bare soil	48.5	90
Litter	31.8	100
Total cover (does not include bare soil or litter)	**29.3**	

[a] Introduced species.
X=present but not counted in plot frames
--=not present on site

Table B-6. Percent Canopy Cover and Frequency of Occurrence on the 100-H Sites in 2002.

Species	% Cover	% Frequency
Poa sandbergii (Sandberg's bluegrass)	18.9	94
Eriogonum niveum (snow buckwheat)	X	X
Salsola kali[a] (Russian thistle)	1.9	74
Achillea millefolium (yarrow)	1.0	38
Sisymbrium altissimum[a] (tumblemustard)	1.5	30
Descurainia pinnata (western tansymustard)	0.1	2
Centaurea diffusa[a] (diffuse knapweed)	X	X
Artemisia tridentata (big sagebrush)	0.1	2
Chrysothamnus nauseosus (gray rabbitbrush)	0.1	4
Bromus tectorum[a] (cheatgrass)	2.3	44
Lactuca serriola[a] (prickly lettuce)	0.1	4
Machaeranthera canescens (hoary aster)	X	X
Epilobium paniculatum (tall willowherb)	0.1	2
Senecio vulgaris[a] (common groundsel)	X	X
Poa bulbosa[a] (bulbous bluegrass)	0.7	8
Draba verna (spring whitlow)	0.5	18
Agropyron sp. (wheatgrass)	4.1	60
Stipa comata (needle-and-thread grass)	0.1	4
Holosteum umbellatum[a] (jagged chickweed)	0.2	6
Hordeum murinum[a] (smooth barley)	X	X
Erodium cicutrium[a] (storksbill)	X	X
Amsinckia lycopsoides (tarweed fiddleneck)	X	X
Lepidium perfoliatum[a] (clasping pepperweed)	0.1	2
Sitanion hystrix (bottlebrush squirreltail)	0.1	2
Penstemon acuminatus (sand beardtongue)	X	X
Chaenactis douglasii (hoary false yarrow)	X	X
Bare soil	49.9	96
Litter	26.7	98
Total cover (does not include bare soil or litter)	**31.3**	

[a] Introduced species.
X = present but not counted in plot frames

APPENDIX C

2001 REVEGETATION MONITORING RESULTS

Appendix C – 2001 Revegetation Monitoring Results

Table C-1. Percent Canopy Cover on the 100-B/C Revegetation Sites in 2001.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	34.5	24.8	17.4	6.9
Eriogonum niveum (snow buckwheat)	1.6	2.7	1.4	2.1
Salsola kali[a] (Russian thistle)	1.1	1.2	1.7	1.3
Achillea millefolium (yarrow)	1.8	0.1	0.1	0.1
Sisymbrium altissimum[a] (tumblemustard)	0.1	X	X	X
Descurainia pinnata (western tansymustard)	0.9	X	0.4	0.1
Centaurea diffusa[a] (diffuse knapweed)	X	X	--	X
Artemisia tridentata (big sagebrush)	0.5	0.6	0.1	0.1
Chrysothamnus nauseosus (gray rabbitbrush)	0.5	0.3	0.1	0.2
Chrysothamnus viscidiflorus (green rabbitbrush)	X	--	--	0.1
Balsamorhiza careyana (Carey's balsamroot)	X	0.1	0.1	X
Bromus tectorum[a] (cheatgrass)	0.5	1.2	1.2	4.2
Lactuca serriola[a] (prickly lettuce)	X	0.2	X	X
Machaeranthera canescens (hoary aster)	X	X	X	X
Epilobium paniculatum (tall willowherb)	0.1	0.1	0.2	0.1
Poa bulbosa[a] (bulbous bluegrass)	1.6	X	--	0.1
Draba verna (spring whitlow)	--	--	--	--
Medicago sativa[a] (alfalfa)	X	X	X	X
Agropyron dasytachyum (thickspike wheatgrass)	4.0	3.1	3.6	3.9
Stipa comata (needle-and-thread grass)	0.4	0.1	0.2	0.1
Tragopogon dubius[a] (yellow salsify)	0.1	X	X	--
Erigeron poliospermus (cushion fleabane)	0.1	X	--	--
Erigeron piperianus (Piper's daisy)	X	--	--	--
Holosteum umbellatum[a] (jagged chickweed)	X	--	--	--
Vulpia myuros[a] (rattail fescue)	0.1	--	--	--
Daucus spp.[a] (carrot)	X	--	--	--
Hordeum leporinum[a] (hare barley)	X	--	--	--
Agropyron cristatum[a] (crested wheatgrass)	--	0.8	X	--
Ambrosia acanthicarpa (bur ragweed)	--	--	--	--
Erodium cicutarium[a] (storksbill)	--	--	--	X
Bare soil	63.0	49.8	41.3	73.2
Litter	35.7	43.1	43.5	22.1
Total cover (does not include bare soil or litter)	**47.5**	**35.3**	**26.5**	**19.3**

[a] Introduced species.
X = present but not counted in plot frames
-- = not present onsite

Table C-2. Percent Frequency of Occurrence on the 100-B/C Revegetation Sites in 2001.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	92	96	92	68
Eriogonum niveum (snow buckwheat)	32	48	36	24
Salsola kali[a] (Russian thistle)	44	48	68	52
Achillea millefolium (yarrow)	22	4	4	4
Sisymbrium altissimum[a] (tumblemustard)	2	X	X	X
Descurainia pinnata (western tansymustard)	34	X	16	4
Centaurea diffusa[a] (diffuse knapweed)	X	X	--	X
Artemisia tridentata (big sagebrush)	10	24	4	4
Chrysothamnus nauseosus (gray rabbitbrush)	8	12	4	8
Chrysothamnus viscidiflorus (green rabbitbrush)	X	--	--	4
Balsamorhiza careyana (Carey's balsamroot)	X	4	4	X
Bromus tectorum[a] (cheatgrass)	20	28	28	72
Lactuca serriola[a] (prickly lettuce)	X	8	X	X
Machaeranthera canescens (hoary aster)	X	X	X	X
Epilobium paniculatum (tall willowherb)	2	4	8	4
Poa bulbosa[a] (bulbous bluegrass)	16	X	--	4
Medicago sativa[a] (alfalfa)	X	X	X	X
Agropyron dasytachyum (thickspike wheatgrass)	42	44	64	24
Stipa comata (needle-and-thread grass)	6	4	8	4
Tragopogon dubius[a] (yellow salsify)	4	X	X	--
Erigeron poliospermus (cushion fleabane)	2	X	--	--
Erigeron piperianus (Piper's daisy)	X	--	--	--
Holosteum umbellatum[a] (jagged chickweed)	X	--	--	--
Vulpia myuros[a] (rattail fescue)	2	--	--	--
Daucus spp.[a] (carrot)	X	--	--	--
Hordeum leporinum[a] (hare barley)	X	--	--	--
Agropyron cristatum[a] (crested wheatgrass)	--	12	X	--
Erodium cicutarium[a] (storksbill)	--	--	--	X
Bare soil	96	96	92	96
Litter	98	92	92	72

[a] Introduced species.
X = present but not counted in plot frames
-- = not present onsite

APPENDIX D

2000 REVEGETATION MONITORING RESULTS

Table D-1. Percent Canopy Cover on the 100-B/C Revegetation Sites in 2000.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	11.9	9	5.7	3.3
Eriogonum niveum (snow buckwheat)	0.55	0.3	X	0.3
Salsola kali[a] (Russian thistle)	1	2	0.8	2
Achillea millefolium (yarrow)	1.6	0.8	0.4	X
Sisymbrium altissimum[a] (tumblemustard)	1	0.3	0.3	1.1
Descurainia pinnata (western tansymustard)	7.6	4.7	4	10.3
Centaurea diffusa[a] (diffuse knapweed)	0.05	X	--	--
Artemisia tridentata (big sagebrush)	0.15	0.4	0.1	1.6
Chrysothamnus nauseosus (gray rabbitbrush)	0.15	0.2	--	X
Balsamorhiza careyana (Carey's balsamroot)	0.05	X	X	--
Poa spp.[a] (residual from straw)	1.4	2.7	1.4	3.9
Bromus tectorum[a] (cheatgrass)	X	--	0.2	7.7
Oryzopsis hymenoides (Indian ricegrass)	--	--	0.1	--
Melilotus officinalis[a] (sweetclover)	X	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	X	X	X
Machaeranthera canescens (hoary aster)	X	--	X	--
Epilobium paniculatum (tall willowherb)	X	0.1	X	X
Microsteris gracilis (annual phlox)	X	--	--	--
Amaranthus albus[a] (pigweed)	X	--	--	--
Senecio vulgaris[a] (common groundsel)	X	--	--	--
Draba verna (spring whitlow)	--	X	--	--
Bare soil	52.45	50.5	41.8	60.1
Litter	46.25	46.7	55.2	37.6
Total cover (does not include bare soil or litter)	**25.45**	**20.5**	**13**	**30.2**

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

Table D-2. Percent Frequency of Occurrence on the 100-B/C Revegetation Sites in 2000.

Species	116-C-5	116-B-11 (16-16-16)	116-B-11 (Micro)	116-B-1
Poa sandbergii (Sandberg's bluegrass)	90	84	88	76
Eriogonum niveum (snow buckwheat)	22	12	X	12
Salsola kali[a] (Russian thistle)	40	40	32	60
Achillea millefolium (yarrow)	16	12	16	X
Sisymbrium altissimum[a] (tumblemustard)	20	12	12	24
Descurainia pinnata (western tansymustard)	34	16	28	64
Centaurea diffusa[a] (diffuse knapweed)	2	X	--	--
Artemisia tridentata (big sagebrush)	6	16	4	8
Chrysothamnus nauseosus (gray rabbitbrush)	6	8	--	X
Balsamorhiza careyana (Carey's balsamroot)	2	X	X	--
Poa spp.[a] (residual from straw)	26	48	36	20
Bromus tectorum[a] (cheatgrass)	X	--	8	56
Oryzopsis hymenoides (Indian ricegrass)	--	--	4	--
Melilotus officinalis[a] (sweetclover)	X	--	--	--
Lactuca serriola[a] (prickly lettuce)	X	X	X	X
Machaeranthera canescens (hoary aster)	X	--	X	--
Epilobium paniculatum (tall willowherb)	X	4	X	X
Microsteris gracilis (annual phlox)	X	--	--	--
Amaranthus albus[a] (pigweed)	X	--	--	--
Senecio vulgaris[a] (common groundsel)	X	--	--	--
Poa bulbosa[a] (bulbous bluegrass)	--	--	--	--
Draba verna (spring whitlow)	--	X	--	--
Bare soil	92	88	88	84
Litter	100	100	100	100

[a] Introduced species.
X = present but not counted in plot frames
-- = not present on site

APPENDIX E

NAME CHANGES INCLUDED IN INTEGRATED TAXONOMIC INFORMATION SYSTEM

APPENDIX E

NAME CHANGES INCLUDED IN INTEGRATED TAXONOMIC INFORMATION SYSTEM

The following represents recent name changes for species mentioned in this report. The first name is that used in *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973), and the second name is the more recent version found in the Integrated Taxonomic Information System (ITIS 1998).

Agropyron spicatum	=	*Pseudoroegneria spicata ssp. spicata*
Chrysothamnus nauseosus	=	*Ericameria nauseosa* ssp. *nauseosa* var. *nauseosa*
Cymopterus terebinthinus	=	*Pteryxia terebinthina* var. *terebinthina*
Epilobium paniculatum	=	*Epilobium brachycarpum*
Festuca octoflora	=	*Vulpia octoflora* var. *octoflora*
Microsteris gracilis	=	*Phlox gracilis* ssp. *gracilis*
Oryzopsis hymenoides	=	*Achnatherum hymenoides*
Poa sandbergii	=	*Poa secunda*
Psoralea lanceolata	=	*Psoralidium lanceolatum*
Sitanion hystrix	=	*Elymus elymoides* ssp. *elymoides*
Stipa comata	=	*Hesperostipa comata* ssp. *comata*

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